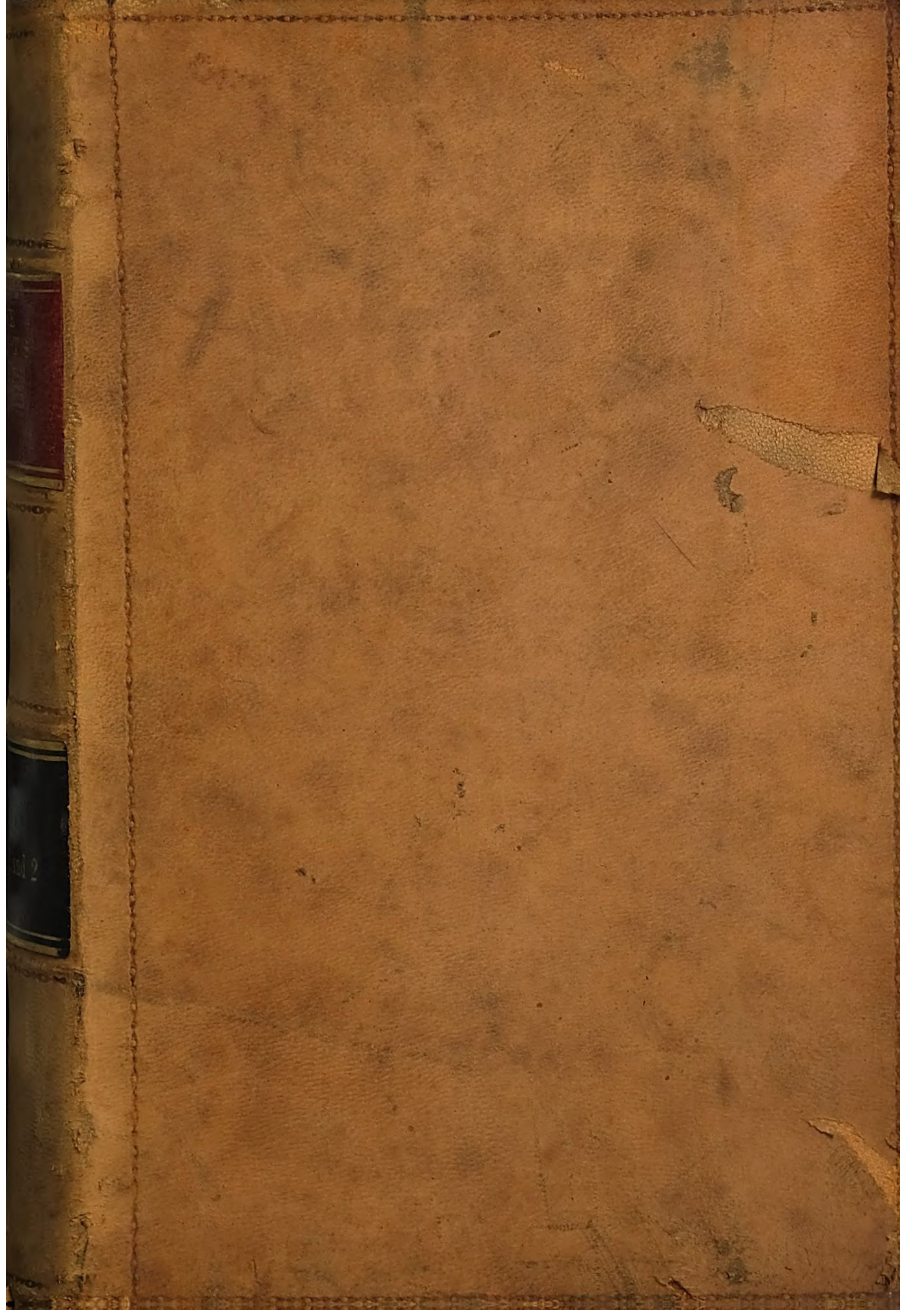




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INDEX

TO THE

EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

FIRST SESSION OF THE FORTY-EIGHTH CONGRESS,

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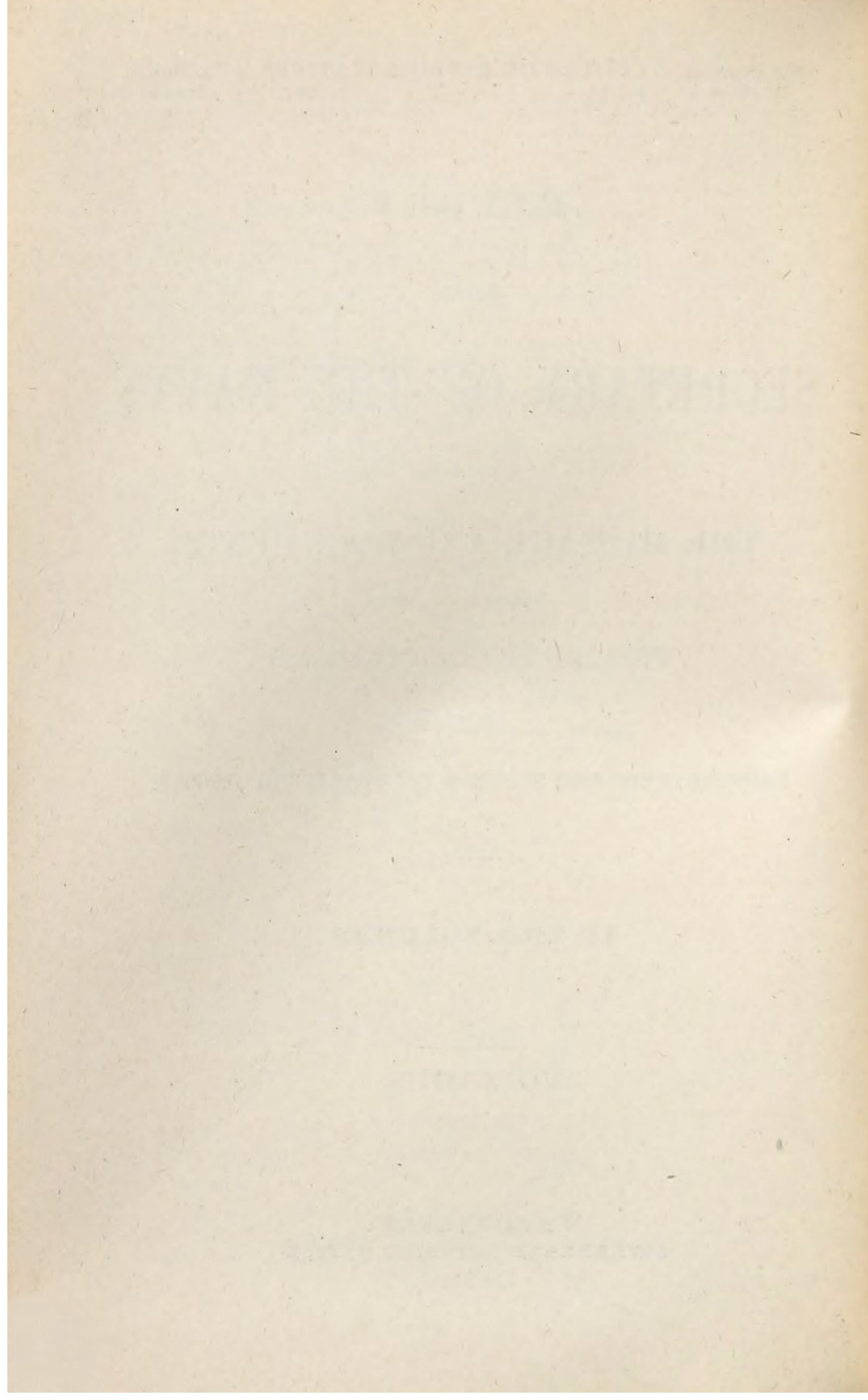
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REPORT
OF THE
SECRETARY OF THE NAVY;
BEING PART OF
THE MESSAGE AND DOCUMENTS
COMMUNICATED TO THE
TWO HOUSES OF CONGRESS
AT THE
BEGINNING OF THE FIRST SESSION OF THE FORTY-EIGHTH CONGRESS.

IN TWO VOLUMES.

VOLUME I.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.



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SECRETARY OF THE NAVY, 1883.

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REPORT OF THE SECRETARY OF THE NAVY.

NAVY DEPARTMENT,
Washington, December 1, 1883.

To the President:

SIR: The three new steel war-vessels and the armed dispatch-steamer, authorized at the last session of Congress, which have been named the Chicago, Boston, Atlanta, and Dolphin, are in course of construction, and will be completed, the cruisers within eighteen and the dispatch-boat within twelve months from the last week in July, 1883.

The general dimensions and characteristics of the ships will be as follows :

	Length.	Breadth.	Draft.	Displacement.	Indicated horse-power.	Estimated sea-speed.	Estimated smooth-water speed.	Capacity of coal bunkers.	Armament of heavy guns.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Tons.</i>		<i>Knots.</i>	<i>Knots.</i>	<i>Tons.</i>	
Chicago	315	48	19	4,500	5,000	14	16	940	14
Boston	270	42	17	3,000	3,500	13	14	580	8
Atlanta	270	42	17	3,000	3,500	13	14	580	8
Dolphin.....	240	32	14	1,500	2,300	15	.....	310	1

These vessels represent three main types of unarmored war-ships now universally considered as indispensable components of any fleet suitable for general national service upon the high seas. The Chicago is an example of the largest and best unarmored cruising and fighting vessels now built, and will have no superior in the world in the combination of speed, endurance, and armament. In the Boston and Atlanta, speed and endurance have been given full development, while their fighting power has been notably increased by placing the battery in a central superstructure on the spar-deck, and adopting a brig rig, thereby leaving the extremities clear and unobstructed for fore and aft fire.

In the Dolphin an important auxiliary in naval operations will be obtained, and she is expected to furnish an excellent model from which

may be expanded a high-speed commerce-destroyer, instead of taking as a standard either the overgrown merchant line steamers or the large and expensive dispatch-vessels which have been built abroad, of questionable utility in time of peace.

The ships are now under construction in accordance with the Appropriation Acts of August 5, 1882, and March 3, 1883, authorizing such increase of the Navy, under the advice and supervision of the Naval Advisory Board, which has consisted of Rear-Admiral Robert W. Shufeldt as president and as additional members Mr. Henry Steers, naval architect, Mr. Miers Coryell, marine engineer, Chief-Engineer Alexander Henderson, Commander John A. Howell, Lieutenant Edward W. Very, and Naval Constructor Frank L. Fernald. By public advertisement and notice of August 5, 1882, as required by the Act of that date, all designers and builders of ships, marine engines, or ordnance were invited to submit plans of any of the vessels, or any part thereof, within the period of sixty days after August 20; and further notice was given November 17 that such period would be extended up to the time for final decision and action. After the general features of the vessels were indicated by the Board, they were submitted to all shipbuilders likely to make proposals for their construction, with requests for their advice and suggestions concerning the designs, with the view of reaching such final plans and specifications as would give the best and most effective ships that could be built. All plans, models, designs, suggestions and explanations from any quarter were fully examined and reported upon by the Board. The general features and essential requisites of the ships having been settled by the Department and the Advisory Board, the plans and specifications were prepared by the Bureaus of Construction and Repair and of Steam Engineering; and on the 2d day of May, 1883, advertisements were published, as required by the Act of March 3, 1883, inviting proposals for their construction, which were opened on Monday, July 2, and all the contracts were on the day following awarded to the lowest bidder, Mr. John Roach, of New York City. The contract for the Chicago is dated July 26, with a bond for due completion in the sum of \$500,000; the contracts for the Boston and Atlanta are dated July 23, with bonds for \$300,000 each; the contract for the Dolphin is dated July 23, with a bond for \$150,000.

The estimates, the contract prices, and the next lowest bids were as follows:

	Cost estimated by the Advisory Board.	Contract prices.	Next lowest bids.
Chicago	\$1, 248, 000	\$889, 000	\$1, 080, 000
Boston	783, 500	619, 000	650, 000
Atlanta	783, 500	617, 000	650, 000
Dolphin	399, 000	315, 000	375, 000

showing a total cost for the hull and machinery of the vessels, excluding the masts, spars, boats, and rigging, for preparing which the navy-yards are to be utilized, of \$2,440,000, being \$774,100 less than the estimates, and \$315,000 less than the next lowest bids.

The statutes authorizing the construction of the cruisers require that they shall be built of "steel of domestic manufacture having as near as may be a tensile strength of not less than 60,000 pounds to the square inch, and a ductility in 8 inches of not less than 25 per centum." Fears were, for a time, entertained that contracts for building the vessels could not be effected at reasonable prices, because of the hesitancy of the steel-makers of this country to bind themselves to furnish the steel required, subject to the scientific and practical tests prescribed by the Advisory Board to ensure a compliance with the law. All difficulties have, however, been happily overcome; and the demonstration that such material can be here produced at moderate cost, is, of itself, of great importance in the progress of our mechanical industries.

ARMORED VESSELS.

The double-turreted monitors *Puritan*, *Amphitrite*, *Terror*, and *Monadnock* have been launched in accordance with the directions of the Act of August 5, 1882. The Naval Advisory Board having been directed by the Act to investigate the question of completing these iron-clads, and having reported December 15, 1882, that it would be wise and expedient to finish them, Congress, in the Act of March 3, 1883, appropriated \$1,000,000 for their engines and machinery, but directed that no contract should be made until the terms thereof should be approved by the Board, and that it should approve only such as should be to the best advantage of the Government, and fair and reasonable according to the lowest market price for similar work.

The Board, after full and careful investigation, determined that fair and reasonable prices would be for the engines and certain connecting hull-fittings of the *Puritan* \$410,209.99, of the *Amphitrite* \$208,712.32, of the *Terror* \$208,712.32, and of the *Monadnock* \$216,006.82; and contracts for the completion of the engines and fittings within eighteen months from January 15, 1883, at the prices named, were made by the Department and approved by the Board, according to the terms of the Act, with Mr. John Roach, of New York City, the Harlan and Hollingsworth Company, of Wilmington, Del., and the William Cramp & Sons' Ship and Engine Building Company, of Philadelphia, for the *Puritan*, *Amphitrite*, and *Terror* respectively. No contract for the machinery of the *Monadnock* has yet been concluded, but it is the intention of the Department to make one, at the price estimated, with the proprietors of such marine-engine shop on the Pacific coast as possesses the best facilities for the prompt execution of the work.

The Act of August 5, 1882, provided for building and fitting the tur-

rets and pilot-house of the Miantonomoh, but satisfactory progress has not been made with the work. It was determined not to proceed until after testing the machinery by a sea trial, which was not completed until December. Careful and protracted consideration by the Department and the Naval Advisory Board led to the conclusion that it was desirable to construct the best modern roller-base turrets, and proposals for the compound armor plates were called for by an advertisement of August 20, 1883, to be opened on October 9. No proposals were received from this country and only one from abroad, that of Messrs. John Brown & Co. and Charles Cammell & Co., of Sheffield, England, through their agents, Messrs. William H. Wallace & Co., of New York, with whom a contract was made November 13, 1883, for the delivery in New York of the plates for the turrets in six months, and of those for the pilot-houses in ten months, at the price in their proposal of £110 per ton of 2,240 pounds, or about \$118,000. In view of the large amount of compound armor or of steel armor which will be required for the completion of the four other monitors, it is desirable that Congress should in some way encourage its manufacture in this country.

The cost of completing the four monitors is estimated by the Naval Advisory Board in a report of October 25, 1883, as follows:

	Hull.	Machinery; turret-gear.	Ordnance.	Total.
Puritan.....	\$955,341 56	\$13,890	\$172,250	\$1,141,481 56
Amphitrite.....	639,583 68	11,500	146,480	797,563 68
Terror.....	627,287 68	11,500	146,480	785,267 68
Monadnock.....	701,441 70	11,500	161,128	874,069 70
Total to complete all monitors.....				3,598,382 62

Their completion is earnestly recommended, as they will provide floating harbor defenses sufficient for present purposes, and may justify us in further postponing the construction of any such expensive broad-side armored ships as have so heavily burdened the treasuries of other nations.

ADDITIONAL NEW VESSELS PROPOSED.

The present condition of our national fleet makes it necessary that the work of reconstruction should be continued as rapidly as a due regard for economy will admit. Accordingly the Advisory Board submitted a report dated October 25, 1883, of its views as to the new work which should be undertaken in the coming year. It recommends the construction of seven additional unarmored steel cruisers, three of which should conform to the types already adopted, as represented by the Chicago, the Boston, and the Dolphin. Of the other four, two should be heavily armed cruising gunboats of about 1,500 tons displacement. These would be of the same size as the Dolphin, but constructed on a different plan, because intended to supply a different want. In

the Dolphin, which is designed for a specific purpose, actual fighting and working qualities are limited, in order to obtain the maximum speed and endurance possible with her size, while in the proposed vessels the aim will be to secure the highest amount of efficiency for general service, both in peace and war. Finally, in view of the necessity for a certain number of vessels of small size and light draft, the Board recommends the construction of two gunboats of about 750 tons displacement, and not more than nine feet draft, which shall be capable of going to sea and also of navigating shallow waters.

The estimated cost of vessels of the proposed types is as follows:

Type.	Hull.	Machinery.	Ordnance.	Equipment.	Total.
Chicago	\$650, 000	\$350, 000	\$225, 000	\$70, 000	\$1, 295, 000
Boston	450, 000	260, 000	168, 000	58, 000	936, 000
Dolphin	232, 000	175, 000	50, 000	25, 000	482, 000
Heavy gunboat.....	216, 000	175, 000	100, 000	25, 000	516, 000
Light gunboat.....	132, 000	77, 000	40, 000	20, 000	269, 000

The total cost of the five vessels, one of each type, will be \$3,498,000, and adding the cost of the two additional vessels of the last two types, the total cost of the seven vessels proposed by the Board, and aggregating 13,500 tons, will be \$4,283,000.

The Board expresses the opinion that the limit of combined efficiency and economy is reached in the cruiser of the Chicago type, of 4,500 tons displacement, and it condemns any policy looking to the present construction of cruisers that shall rival in speed the fastest transatlantic steamers. The merchant steamers having this exceptionally high speed comprise less than one-hundredth part of the ocean steam-tonnage of the world, either in number or value, and most of them in the event of a war would be withdrawn from their ordinary pursuits. In order to match their speed it would be necessary to build vessels with a displacement of at least 11,000 tons; and while the great draft and dimensions of such vessels would confine their general efficiency within the narrowest limits, they would absorb for their maintenance and management an undue share of the current appropriations and of the existing allowance of seamen. Furthermore, the cost of building and fully equipping one such vessel would be at least \$4,000,000, or nearly as much as that of all the seven ships recommended by the Board.

In the above opinion and recommendations the Department concurs. If, however, it should appear to Congress desirable to construct one vessel in which all other qualities shall be sacrificed to the attainment of the highest possible speed, and to provide for maintaining it in commission, the Department will gladly submit plans and estimates therefor, and the vessel when completed will no doubt add to the capabilities of the Navy. But the immediate object should be at moderate expense to replace our worn-out cruisers with modern con-

structions fitted for general service, and for this reason the reconstruction should for the present be continued on the lines already begun. In presenting the recommendations of the Board, the Department, in addition, advises the construction of one of the five steel rams recommended by the first Advisory Board, November 7, 1881, and by the report of last year; of one cruising torpedo-boat, at a cost of \$38,000, advocated by the same Board, and by the present Board in its memorandum of November 21, 1882; and of two of the ten harbor torpedo-boats recommended by the first Board, of the kind asked for in the Ordnance report of this year.

The recommendations of the Board and the Department are believed to be in pursuance of a wise plan for that reconstruction of our naval force which all admit is, in some form and to some extent, indispensable to the national welfare. Such a plan should conform to the demands of our national policy. The scope of that policy, as it relates to the maintenance of a military establishment, has been clearly and ably outlined by the late President Garfield, and his judicious words may well serve as guides in any action that we may take to-day. In a speech made in 1878, in the House of Representatives, he said: "The men who created this Constitution also set it in operation, and developed their own idea of its character. That idea was unlike any other that then prevailed upon the earth. They made the general welfare of the people the great source and foundation of the common defense. In all nations of the old world the public defense was provided for by great standing armies, navies, and fortified posts, so that the nation might every moment be fully armed against danger from without or turbulence within. Our fathers said: 'Though we will use the taxing power to maintain a small Army and Navy, sufficient to keep alive the knowledge of war, yet the main reliance for our defense shall be the intelligence, culture, and skill of our people; a development of our own intellectual and material resources which will enable us to do everything that may be necessary to equip, clothe, and feed ourselves in time of war, and make ourselves intelligent, happy, and prosperous in peace.'"

With the views of American policy thus expressed the Department is in perfect accord. It is not now, and it never has been, a part of that policy to maintain a fleet able at any time to cope on equal terms with the foremost European armaments. The possibility of such war is not lost sight of; but with our isolated position, and traditional peace policy, it is a remote contingency, and we should cherish no ambition to take the lead among the naval powers of the world; certainly not until we again become foremost in the possession of a merchant marine. Any difference which would involve us in a conflict with one of the great powers should be the growth of time, affording opportunity for gradual preparation. On the other hand, in order to be prepared, not

merely by the potentiality of our immense resources but also by an actual armament, to assert at all times our natural, justifiable, and necessary ascendancy in the affairs of the American hemisphere, we unquestionably need vessels in such numbers as fully to "keep alive the knowledge of war," and of such a kind that it shall be a knowledge of modern war; capable on brief notice of being expanded into invincible squadrons. It is well known that we have not the elements of such a force to-day. The condition of decrepitude into which the fleet has fallen through a failure to provide for its gradual renewal by modern ships is justly a subject of ridicule at home and abroad. The vessels available for actual service are insufficient to give training to the officers and seamen, unequal to the present necessities of the Government, and unworthy of a great and prosperous maritime state.

The specific plan, which, in the opinion of the Department, should be adopted, looks to a gradual replacement of the present decaying fleet by modern constructions. The proviso of the Act of March 3, 1883, limiting the repair of wooden ships to 20 per cent of their cost, should be continued in force, in order that no money may be expended in rebuilding worn-out structures of an obsolete type. Provision should then be made for building new cruisers, with due care and economy, by an annual outlay extending over a considerable period. At least seven modern vessels should be built in each year, until the Government has acquired a new steel Navy. Of the annual expenditure of four millions which such a plan would require, from one-third to one-half can be saved by abandoning attempts to rebuild the present wooden fleet, and by other wise retrenchments in the naval appropriations.

The first Advisory Board, in its report of November 7, 1881, gave an estimate of the required strength of a suitable unarmored cruising fleet. The report of this Board, composed of eminent naval officers, represents the highest professional opinion, and certainly these officers would not underestimate the necessities of the Government. The standard adopted by them may therefore be safely regarded as a maximum for the naval force in time of peace. The report fixed the number of vessels required in commission at all times at forty-three, and the reserve at twenty-seven, making a total of seventy. To provide such a force it recommended the construction of thirty-eight vessels. Further deterioration in the existing fleet since the report was made will necessitate an increase in the number of new ships in order to obtain the force as established by the Board. As sufficient for that result, the Department would therefore advise the continuance of the policy recommended of building annually at least seven new ships, during the next ten years, before the end of which period the country will find itself possessed of a modern steel navy in every way adequate to the maintenance of the safety and honor of the nation.

PERSONNEL OF THE NAVY.

The Act of August 5, 1882, provided for a gradual reduction in the number of officers of the Navy, until a standard should be reached corresponding to the necessities of the service. This gradual reduction is now in progress, and should be allowed to continue. Its reversal or modification would result in keeping in the service a body of officers too large to be fully employed. No substantial departure from the policy of the Act can be defended on any sound principles of efficient and economical administration; it would be in the highest degree detrimental to the service, and injurious to the interests of the Government. The numbers established by the Act form in general the closest approximation to the requirements of the Navy, when the fleet shall be brought up to its full strength. This is clearly shown by a comparison between the maximum number of officers required for the fleet and the number which the Act leaves available for sea duty.

As the figures of the first Advisory Board may be assumed to give the maximum of ships needed, the full complement of those ships, with proportional reliefs, should give the maximum number of officers needed. A close estimate of this complement is readily made. The Board fixed the size of the fleet to be kept in commission at forty-three vessels. It recommended the construction of thirty-eight new ships, of four types. On January 1, 1883, there were in commission twenty-four steam-vessels of the first, second, and third rates, excluding the *Alaska*, which was laid up shortly after, and the *Ashuelot*, which was lost. By adding to these twenty-four ships in commission one-half of the thirty-eight proposed new ships, we obtain a sea-fleet of forty-three ships, the number laid down by the Board. The complement of the twenty-four existing vessels is shown by the list of January 1; the complement of nineteen of the proposed vessels may be determined from their size, according to the same standard. Such a calculation shows the number of officers required constantly at sea in the ships of the projected fleet to be as follows: Line officers, 365; medical officers, 83; pay officers, 43; engineer officers, 157.

The number of officers who will be available for sea duty under the reduced list of the Act of August 5 may be easily reached. It may be regarded as a general principle, and one which has reason and usage for its support, that under a fair assignment of duties, the three highest grades of officers, namely, rear-admirals, commodores, and captains, will pass at least one-third of their time at sea; commanders, lieutenant-commanders, and lieutenants, one-half; and lieutenants of the junior grade and ensigns, their whole time. In other words, in order to be reasonably occupied with the duties of their profession, one-third of the first class should be at sea, one-half of the second, and all of the third. Of the three principal staff corps, one-half of the medical inspectors, surgeons, and passed assistant surgeons, and of the

pay and engineer officers of corresponding grades, and all the assistant surgeons, assistant paymasters, and assistant engineers, should be at sea. Upon such a basis, it will be found that the numbers fixed by the Act of August 5 provide a force constantly available for sea as follows : Line officers, 375 ; medical officers, 83 ; pay officers, 47 ; engineer officers, 100.

It is therefore beyond question that upon a liberal allotment of duty or residence on shore to officers, the reduced numbers are ample for the maximum number of vessels to be at sea, as determined by the highest professional authority ; while for the existing fleet they afford an extraordinary surplus. An exception must be made in the case of the Engineer Corps, whose numbers were to be reduced 100 by the recent Act. Reduction is needed here as elsewhere, but it might safely be limited so as to correspond to that in the other branches of the service, which result would be nearly effected by fixing the number of passed assistant and assistant engineers at 150, instead of 100, making the reduction 50 instead of 100. Against the reduction thus limited, no sound argument can be offered.

Under the most favorable circumstances, if the work of rebuilding new ships progresses steadily, it will be ten years before the maximum fleet is attained. As the personnel, under the reduced standard, is sufficient for such a fleet, it is more than sufficient for the present ships, and, moreover, it has not yet fallen to the reduced standard. There is therefore a double superfluity of officers ; first, in the excess of the reduced complement over the demands of the existing fleet, and secondly in the excess of the present list over the reduced complement. In view of this excess, economy demands that the reduction should be made at once, instead of being postponed for the slow and gradual operation of nature. Furthermore, as long as the excess remains, promotion will be delayed, and deserving men will be compelled to wait for their advancement. Some measure should be adopted to hasten the reduction. It is therefore recommended, first, that the law be so amended as to cause the retirement of all officers at the age of sixty-two years. As it now stands, no officer can be retired on account of age until he has reached the grade of commander. If rear-admirals, commodores, captains, and commanders should retire from active service at sixty-two, much more should lieutenant-commanders and lieutenants. Secondly, it is recommended, as a prompt and practical way of making the reduction prescribed by law, that a Board be appointed immediately, to be composed of nine officers of high rank, on the active or retired list, who shall scrutinize thoroughly the list of officers in the several corps, and shall select therefrom the number fixed by the Act of August 5, namely, 620 line officers from and including the grade of rear-admiral to and including the grade of senior ensign, 170 medical officers, 96 pay officers, and 220 engineer officers (these last being increased for the reasons already stated), to be retained on the

active list to discharge the current duties of the service, and to be entitled to their promotion after proper service and examination as vacancies occur, without reference to the officers not thus selected, who shall be considered supernumerary, and placed on a separate list, not entitled to promotion, and with leave-of-absence pay, but subject to be ordered to service with the proper pay of their grade in time of war, and who shall retire on reaching the age fixed by law, or may retire at any time before reaching that age on their own application. In order to secure the selection of the best officers in each corps, it may be advisable to authorize the choice to be made from the whole list of officers in that corps, disregarding the numbers now prescribed for the various grades, but conforming the final number for the corps to that fixed by law.

The immediate creation of the foregoing supernumerary list is imperatively demanded if the naval service is to be properly conducted. While the intelligence, correct principles and habits, and zeal and fitness for duty of the great mass of the corps of 1,410 commissioned naval officers, of whom 602 were, on August 1 last, at sea and 808 on shore, should be freely admitted, yet it may truthfully and properly be stated that a certain proportion of the officers in every grade are, for various reasons, not fitted for or likely to be ordered to the command of vessels or any other important duty. Their deficiencies are not so tangible as to afford grounds for excluding them from the service by courts-martial, and many of them manage to work through the examinations for promotion. Their number is not large, and it is certainly not desirable to exaggerate the evil as a means of correcting it. But such officers, whether few or many, are an incubus upon the establishment. They do no service, are an unnecessary public burden, and stand in the way of competent, faithful, and meritorious officers. They can be effectually reached only by the method proposed of selecting the number of officers actually needed for the service from the best in each corps, whereupon the worst will, without being named or stigmatized, drop out of sight by operation of law. The process of selection should be well guarded, but Congress should be earnestly urged to authorize its institution and thereby to ensure at once a much-needed improvement in the personnel of the Navy.

The recommendations of one year ago for allowing all promotions to the grade of rear-admiral to be made by selection from the commodores or captains, and for abolishing the grade of commodore by omitting to fill vacancies, are renewed; and it is also recommended that a fixed amount of sea-service in each grade should be required as a condition of promotion.

While the foregoing improvements and reforms concerning the personnel of the Navy should be insisted upon, there are some features of injustice which should at the same time be remedied. The present arrangement of the list is defective by reason of certain inequalities which bear hardly upon particular groups of officers, principally in the way of

delayed promotion. It is desirable that advancement either in pay or in rank shall go on by regular stages and never be unduly delayed. If from any cause, as is now the case with one-half the vacancies, promotion is stopped so that officers find themselves advancing to middle life without any corresponding advance in station, discouragement and apathy follow, to the manifest injury of the service. The groups of officers in reference to which a change is recommended are the lieutenants, the ensigns of the junior grade, and the passed assistant engineers.

LIEUTENANTS.

By the Act of July 15, 1870, the lieutenant-commanders were reduced one hundred and the promotion of lieutenants was stopped until the reduction was effected. The head of the lieutenants' list, therefore, remained stationary for over six years. In 1877 promotions were resumed, but were again stopped by the Act of August 5, 1882, since which only four have been made. The forty-five officers at the head of this list have been nearly fourteen years in that grade, and under the present law few will be advanced in many years. It is therefore recommended that the lieutenant-commanders be increased forty-five and the lieutenants reduced by the same number, to be immediately promoted, subject to the usual examination.

PASSED ASSISTANT ENGINEERS.

The case of the passed assistant engineers is one of peculiar hardship. Nearly forty, who were in active service during the war, have been from fifteen to seventeen years in their present grade, and since the first five years have received no increase of pay. In the present state of the list they cannot look for promotion for several years. The Secretary of the Navy, in his annual report for 1881, called attention to their unfortunate situation. A bill for their relief received a favorable report from the naval committees of both Houses at the first session of the Forty-seventh Congress, and in 1881 a similar bill passed the Senate but was not reached in the House. It is recommended that their pay be fixed, but not retroactively, after ten years from the date at which they took their present rank, when at sea, at \$2,450; on shore duty, at \$2,250; on leave or waiting orders, at \$1,900; and after fifteen years from such date, when at sea, at \$2,700; on shore duty, at \$2,350; on leave or waiting orders, at \$1,950.

JUNIOR ENSIGNS.

The status of junior ensigns also calls for the attention of Congress. The lowest grade in the Army and in the Marine Corps, that of second lieutenant, corresponds to that of ensign, and so does the lowest relative rank in the naval staff-corps. In the line exists the anomalous grade of junior ensign, in which officers must pass several years at the present rate of promotion. During this period, therefore, they

are junior to every other officer in their own service, and to the lowest commissioned officer in the Army. As graduates of the Academy are now appointed to the Engineer Corps and the Marine Corps as well as to the line, members of the same graduating class, who enter the more favored corps, obtain at once rank and pay above their comrades who enter the line. The Department therefore recommends the abolition of the rank of ensign of the junior grade; that commissions as ensigns be issued to the present officers of that rank; and that all graduates hereafter appointed to the line shall receive such commissions. It is further recommended that naval cadets who, after four years at the Academy, are serving for two years at sea prior to final graduation, be called midshipmen, but without other change in their status.

MATES.

Attention is also called to the position of the mates. The appointment of mates was a necessary measure during the war, by reason of the deficiency then existing in the junior grades of line officers. The necessity has now passed away; but the 38 mates still in the service form a deserving body of men, who should not be disturbed as they are approaching old age. It is recommended that legislation be adopted discontinuing the appointment of mates, but applying the provisions of naval retirement to those now in the service.

RESTORATION OF DISMISSED OFFICERS.

Congress should be earnestly requested not to restore to the Navy officers who have been dismissed for failures to pass their examinations for promotion, or for delinquencies established by trials before courts-martial. It may fairly be affirmed that more demoralization to the service has resulted from such restorations and from unwise remissions of sentences justly imposed than from all other causes. No officer should be upon the naval list, whom the head of the Department could not order to sea, as commanding or executive officer, without bringing upon himself severe censure in case of the loss of the ship. Yet this has been the status of most dismissed officers who have been restored. Lenient judgments and sympathy for officers who have been authoritatively condemned and dismissed should not be allowed to operate to again place the delinquents where they must either be supported as pensioners, while they continue a reproach to the service and an obstacle to the promotion of their faultless comrades, or else be sent to sea to the great peril of the ships of the Navy and of the lives of those on board. These remarks apply with especial force to cases of dismissal for drunkenness. To place or retain officers with such habits as life-burdens upon the people is a grievous public wrong.

ORGANIZATION OF THE DEPARTMENT.

It is a fundamental principle of our Republic that "in all cases and at all times the military ought to be under strict subordination to and governed by the civil power." This subordination is effected through the execution of the laws of Congress concerning the Army and Navy, by the President, who is its constitutional commander-in-chief, and who exercises his control through Secretaries from civil life. These, however, are encompassed, the one by 2,129 Army officers, annually expending from thirty to fifty millions, and the other by 1,410 naval officers, expending from fifteen to twenty millions. The chiefs of the bureaus necessary for departmental organization must be officers; and in the War Department they hold their bureau positions during life. To enforce absolutely civilian control and represent popular ideas in such great military establishments requires constant watchfulness and effort from the Secretaries. But no Secretary can maintain the requisite physical and mental power and endurance with the assistance that is afforded under the present departmental organizations, in which the only civilian aids are the clerks, who in the course of years cease to be an adequate counterpoise to the military element. No Secretary of War or of the Navy ought, therefore, to be allowed by Congress to undertake his duties without at least an assistant secretary and a solicitor, called directly from civil life, and paid liberal salaries. If these two Secretaries, who are expected to enforce every economical or administrative measure which Congress may enact, are not furnished additional civilian aids, it might be better to abolish the secretaryships, cease to interpose citizen officers to represent the President in his constitutional command, and give full control of all details to the General and Admiral. But instead of thus formally or in effect abandoning the true traditional theory as to the management by the people and President of their Army and Navy, Congress should rather take steps to re-enforce the civilian Secretaries by giving them the ablest possible assistants in their important labors.

NAVY-YARDS.

The Navy-Yard Commission, appointed October 9, 1882, by direction of Congress, consisting of Commodore S. B. Luce, Chief-Engineer Charles H. Loring, and A. B. Mullett, esq., civilian member, have made a report dated December 1, 1883, which will be transmitted to Congress; and careful attention should be invited to the facts, opinions, and recommendations therein submitted.

By request from the Department, the Commission, on the 6th of June and on the 11th of October, furnished for immediate action statements of their specific recommendations, most of which have been adopted by the Department. They advise a reorganization and concentration of

the mechanical departments of those yards which may be kept open for the construction or repair of vessels, so that there shall be but one shop in each for the performance of any one class of work, and that each of the several articles that form a part of the outfit of a ship shall be made in one yard only.

Concurrently with the foregoing improvements in general administration, they recommend that the New York, Norfolk, and Mare Island yards be kept in use as working yards; and that the Washington yard be retained for the manufacture of standard articles, but not as a ship-yard for the repair of vessels.

They recommend that the New London yard be closed, and that the Naval Asylum at Philadelphia be transferred to the vacated site on the Thames. The Department has accordingly closed this yard, and advises that, if the Naval Asylum is not thus moved, the New London navy-yard be returned to the State of Connecticut, as not likely to be needed for any purpose of the national Government.

The Commission recommend that the Pensacola yard be closed, and this has been done. The doubt as to the defensibility of this yard leads to their recommendation that a commission be appointed to determine at what place in the Gulf of Mexico a naval station should be located. This recommendation is approved by the Department.

The members of the Commission differ as to the Boston yard. Two think that it should not be used as a construction and repair yard in time of peace, but all agree that the ropewalk and sailmakers' shop should be continued in operation, and that the yard should not be sold, but kept for use in time of war. Work upon the construction and repair of vessels has therefore been suspended. In view of the great value of the ground occupied by this yard in the heart of Boston, it is worthy of serious consideration whether it should not be sold.

The Commission also differ as to the present disposition of the Portsmouth yard; one member believing that it should be kept open as a sanitary station and for the repair of wooden ships, but all agreeing that no permanent improvements should be made. Repairs of wooden vessels have been continued for the present, and when the yard ceases to be used as a naval workshop it can wisely be kept for a supply station and arsenal, as the land which it includes would only sell for a small price.

The Commission recommend that the League Island yard "be closed both as a yard and as a naval station until plans have been prepared and approved for such a yard as the Department requested authority to construct and Congress authorized, and until the filling, the construction of the quay walls and the gateways to the great ship-basin in the back channel are completed," but they consider the site too valuable and desirable to be abandoned, and therefore recommend its completion on the original basis; yet they say that it is totally unfit for an ordi-

nary or small yard, and that if the original plan is to be abandoned the Island should be also. The yard has therefore been closed.

The surface of League Island varies from one to three feet below high-water mark, and the yard will embrace 567 acres of land and 356 acres of water. An estimate of the expenditures which will be required according to the original plans reaches a total of \$60,695,103.80. The views of the Commission therefore do not seem to be sound. If the League Island yard cannot be made efficient without so large an expenditure, it should be promptly given back to the city of Philadelphia; and if a navy-yard is required on the Delaware River, a site of moderate area should be found on higher and healthier ground.

While the general views of the commission are deserving of candid consideration, yet it must be remarked that their ideas are large and not likely to be soon realized. They assume that the United States will maintain a great and powerful navy, and consequently will need many expensive docks, dockyards, and marine engine shops. Such has not been our policy; and will not be even when our merchant marine is revived and we again become a maritime nation. At all events, until then we shall require only moderate squadrons, and these, although they should be composed of the best modern ships, can be built and maintained without our hastening to make heavy expenditures for dockyards. We can afford to take full time to consider and determine deliberately our policy as to the number of our naval vessels and the best method of constructing and repairing them, if, in the mean time we close such repair shops as are not needed and check extravagance at those which are still used.

Much difficulty has been experienced in effecting navy-yard reforms, owing to the opposition of persons interested in the existing system, not only to closing the repair shops in yards to be hereafter kept only as naval stations and arsenals, but also to concentration and economy at yards which are to be kept open for work. The assistance and specific directions of Congress should therefore be sought and effectively accorded. The arguments and facts which show that reforms should be instituted are overwhelming. The change of naval construction from wooden to steel ships would of itself involve a revolution in methods of work. With but little more than thirty vessels in commission, only five or six have required repairs at any one time, and by distributing these among as many navy-yards, the cumbrous organization and heavy expenditures at each yard have been hung upon and charged to the one ship then in hand with the results which published records have shown.

In the report of last year was submitted an exhibit showing the force employed at the navy-yards on the 16th day of November, 1882, with the compensation paid the employees and workmen on that day, and

the work then in progress on ships-of-war. A similar exhibit for November 16, 1883, is as follows:

Navy-yards.	Commissioned and warrant officers.	Enlisted men and marines.	Employees other than or- dinary me- chanics and workingmen.		All other em- ployees.		Total employ- ees.		Work in progress on ships-of-war.
	No.	No.	No.	Pay-roll Nov. 16.	No.	Pay-roll Nov. 16.	No.	Pay-roll Nov. 16.	
Portsmouth .	22	82	61	\$219 36	481	\$1, 213 69	542	\$1, 433 05	Repairing Omaha and Marion.
Boston	48	279	71	262 63	303	725 92	374	988 55	Repairing Shenandoah.
New York ...	72	444	124	405 17	758	2, 006 57	882	2, 411 74	Repairing Galena, Yantic, Alliance, and Vandalia.
League Isl. and.	43	164	71	252 84	506	1, 305 12	577	1, 557 96	Repairing Ossipee.
Washington .	41	161	86	269 00	485	985 03	571	1, 254 03	Making anchors, chains, and sails for Ossipee and boilers for Marion and New York.
Norfolk	40	286	99	284 41	471	925 90	570	1, 210 31	Making boilers for Van- dalia and Alliance.
Pensacola ...	7	27	8	25 23	44	83 98	52	109 21	None.
Mare Island .	34	234	73	322 11	711	2, 310 28	784	2, 632 39	Repairing Monongahela and Mohican.
Total at all yards.	307	1, 677	593	2, 040 75	3, 759	9, 556 49	4, 352	11, 597 24	

The question whether all the steel naval vessels of the future shall be constructed by contract, or some of them by contract and some in the navy-yards, it is not necessary immediately to determine. Assuming that the hulls of such ships might be judiciously and economically built in the yards, it is doubtful whether the machinery will ever be so constructed. All the engines for the British navy are built in private shops. But conceding that, wherever the ships may be originally built, it is desirable for the Government to possess shops fitted for such repairs as may from time to time be found necessary, it is due to truth to declare that the Government repair shops under the present system ought not to be intrusted with them.

These establishments must first be thoroughly reorganized in such a way as to exclude all political considerations from their management, otherwise bad and expensive work will be the result. We cannot afford to destroy the speed of our naval engines in order to make votes for a political party. Whatever other governmental agency may be conducted with partisanship, a great naval workshop, dealing with the hull of a modern steel steamship, its fittings and equipment, and with the complexities of its machinery, cannot be successfully so managed. No charge of favoring private ship-building establishments should deter any one from asserting that, until the navy-yard workshops are managed on business principles and without regard to politics, the construction and repair of the new American Navy should be committed to those

builders who employ or discharge their foremen and all their artisans according to their skill as mechanics and without caring for their political opinions or votes.

SALES OF CONDEMNED SHIPS, STORES, AND SUPPLIES.

In pursuance of the act of Congress of August 5, 1882, and of reports of the inspection boards, made as therein directed, the following condemned vessels have been stricken from the Navy Register: Congress, Guard, Plymouth, Kansas, Emerald, Massachusetts, Sabine, Connecticut, Iowa, Niagara, Oregon, Ohio, Pennsylvania, Virginia, Florida, Blue Light, New Orleans, Colossus, Java, Susquehanna, Glance, Burlington, Supply, Sorrel, Antietam, Dictator, Frolic, Relief, Pawnee, Rose, Benicia, Nyack, Saco, Old Monadnock, Narragansett, Tuscarora, Alaska, Worcester, Canandaigua, Jean Sands, Shawmut, Savannah, Santee, Phlox, Wyoming, Roanoke.

Of these vessels, the Wyoming, Antietam, Supply, Emerald, Santee, Phlox, Jean Sands, and Rose have been reserved for purposes for which they can be made useful, or for future sale. The Massachusetts, Connecticut, Oregon, Pennsylvania, Virginia, Colossus, Java, and Canandaigua, all except the last being uncompleted at the navy-yards, will doubtless be there taken to pieces, as they cannot be advantageously sold. The remaining twenty-seven vessels, excluding the Florida, Pawnee, and Benicia, for which no bids were made, have been sold to the highest bidders, in accordance with the statute. Their appraised value was \$330,100, and they sold for \$384,753, an advance of \$54,653 over the appraisement.

Sales at public auction of condemned stores and supplies have also been made at the navy-yards under the provisions of the second section of the act, amounting to about \$138,000.

MOVEMENTS OF VESSELS.

The force on the *North Atlantic Station* remains under the command of Rear-Admiral George H. Cooper, and consists of the flagship Tennessee, the Vandalia, Swatara, Alliance, and Yantic. The Kearsarge was transferred to the European station May 31. All except the Yantic made cruises during the year to the West Indies. The Flagship made a special visit to Venezuela, and the admiral and other officers participated in the ceremonies at Caracas connected with the unveiling of the statue of Washington during the Bolivar Centennial. Their presence was highly appreciated by the Government and people of Venezuela. The Tennessee also took part with other vessels in the ceremonies attending the opening of the Brooklyn Bridge May 24, and in the Centennial celebrations at Newburgh October 18, and New York City, November 26. The Vandalia, Swatara, and Alliance each made a cruise along the fishing banks, and the Swatara is now at

Port au Prince, Hayti, and the Alliance on the way thither. The Yantic, on her return May 22 to the Brooklyn navy-yard from cruising in the Gulf and along our South Atlantic coast, was on June 13 dispatched to the coast of Greenland as a tender to the steamer Proteus, containing the relief party, under Lieut. E. A. Garlington, sent by the Chief Signal Officer of the Army to endeavor to bring back the exploring party under Lieut. A. W. Greely, at Lady Franklin Bay. The Yantic visited Disco, Upernavik, and Littleton Island, and returned to New York September 29, having taken on board at Upernavik Lieut. Garlington and party and also the officers and crew of the Proteus, which had been crushed in the ice July 23, near Cape Sabine; but bringing no tidings of the Greely expedition.

The *South Atlantic Station* is now under the command of Commodore Thomas S. Phelps, who relieved Capt. Aaron W. Weaver, temporarily in command, the former commanding officer, Rear-Admiral Peirce Crosby, having been transferred to the Asiatic station. The force now comprises the Brooklyn (flagship), and the Nipsic. The Galena returned to New York September 3, and was put out of commission. The limits of this station have been extended beyond the Cape of Good Hope to 70° east longitude, and as far north in that quarter as the equator. The flagship is now on a cruise to the coasts of Madagascar, the Comorres and other islands, to ports on the east coast of Africa as far north as Zanzibar and to the island of St. Helena. The Nipsic arrived at Rio de Janeiro August 10 from New York, and at last advices was at Montevideo.

The *European Station* is now commanded by Rear-Admiral Charles H. Baldwin, who relieved Rear-Admiral J. W. A. Nicholson on the 10th of March, 1883. The ships are the Lancaster (flagship), and the Quinnebaug and Kearsarge, the last having taken the place of the Nipsic. The Lancaster, under instructions from the Department, proceeded on the 17th of April, 1883, from Havre, France, to Cronstadt, Russia, and Rear-Admiral Baldwin and staff were present at the coronation of the Emperor at Moscow. The Quinnebaug was employed on the coast of Africa from January to August, and the Kearsarge, which joined the station in September, has sailed for the coast of Morocco.

The *Pacific Station*, under the command of Rear-Admiral A. K. Hughes, who relieved Rear-Admiral George B. Balch, now has within its limits the following named vessels: The Hartford, (flagship), Lackawanna, Iroquois, Wachusett, Adams, and the store-ship Onward. The former flagship, the Pensacola, was detached in June under orders to return to the United States by way of Honolulu, Japan, China, and Cape Town, Africa. The Hartford, before she became the flagship, made a cruise to Caroline Island, carrying a party of observers of the solar eclipse, sent by the National Academy of Sciences; and has since cruised along the Central American coast, and is now on the way to Callao. The other vessels, excepting the Adams, which continues

at Sitka, Alaska, have made cruises along the west coast of South America. The Lackawanna and Wachusett were present at Honolulu during the coronation ceremonies of the King of Hawaii, February 12, 1883.

The force on the *Asiatic Station*, which last year consisted of the Richmond (flagship), Ashuelot, Monocacy, and Palos has been increased by the Juniata, Enterprise, and Essex, and reduced by the loss of the Ashuelot, February 18, 1883, upon Lamock Island. Rear-Admiral J. M. B. Clitz was relieved, April 21, by Rear-Admiral Peirce Crosby, and the last-named officer having been placed on the retired list October 29, 1883, at his request, in accordance with the provisions of law, Commodore John Lee Davis has been ordered to take command of the Station, and left San Francisco November 22 for that purpose. The vessels have visited the important ports in China, Japan, and Corea. The Enterprise, on the way from the United States to join the Station by the Cape of Good Hope, visited various ports and islands on the east coast of Africa; and the Juniata, proceeding by the Suez Canal, touched at points in Egypt, Arabia, Persia, and India. The Trenton, with the Corean Embassy on board, sailed November 29 to join this station.

The *Apprentice Training Squadron* continues under the command of Commodore S. B. Luce. The vessels are the New Hampshire (flagship), Minnesota (gunnery ship), and the sailing ships Saratoga, Portsmouth, and Jamestown. The Saratoga made a cruise to Lisbon, and after her return to New York participated, in company with the Portsmouth, in the Centennial celebration at Newburgh. The Portsmouth cruised in the West Indies and along the Atlantic coast of the United States. The Jamestown cruised in the West Indies, and afterwards made a cruise to Lisbon.

The vessels employed on SPECIAL SERVICE are the Powhatan, which has cruised in the West Indies and along the Spanish Main, and later to the fishing banks; the Michigan, on Lake Erie; the Ranger, surveying the Mexican and Central American coasts; and the Despatch and Tallapoosa.

THE JEANNETTE EXPEDITION.

In pursuance of a resolution of Congress, approved August 8, 1882, a court of inquiry concerning the loss in the Arctic seas of the exploring steamer Jeannette was convened, composed of Commodore William G. Temple, president; Captain Joseph N. Miller and Commander Frederick V. McNair, members, and Master Samuel C. Lemly, judge advocate, which met October 5, 1882, and on February 17, 1883, the record of its proceedings and findings was submitted. The conclusions reached by the court were to the effect that the condition of the Jeannette on her departure was good; that her management was marked by judgment and prudence; that she was crushed by a pressure of ice that would have annihilated any vessel; that the contingency of the loss of the vessel had been provided for, and that the plans adopted upon leav-

ing the wreck were judicious; that proper efforts were made by the various officers to ensure the safety of the parties under their immediate charge, and that everything possible was done for the relief of the other parties; and that after the separation of the three boats on September 12 there is no further record of Lieutenant Chipp's party.

The court also found that there was no occasion to impute censure to any one connected with the vessel, and that "the general conduct of the personnel of the expedition seems to have been a marvel of cheerfulness, good fellowship, and mutual forbearance, while the constancy and endurance with which they met the hardships and dangers that beset them entitle them to great praise;" also that special commendation is due to Lieutenant-Commander DeLong for the high qualities displayed by him in the conduct of the expedition; to Chief Engineer Melville for his zeal, energy, and professional aptitude, which elicited high encomiums from his commander, and for his subsequent efforts in the Lena Delta; and to Seamen Nindemann and Sweetman for services which induced their commander to recommend them for medals of honor. The court, having adjourned February 12, was reconvened March 30 for the examination of those survivors of the expedition who had in the mean time returned from Siberia, and submitted a final finding on April 23, to the effect that no modification was requisite in the conclusions previously reported. The findings were approved by the Department.

Lieut. Giles B. Harber and Lieut. W. H. Schuetze were ordered by the Department on February 2, 1882, to proceed to Siberia and prosecute the search for the missing officers and men of the *Jeannette*. They arrived at Irkutsk on March 25, and, after fruitless efforts to obtain a suitable steamer, proceeded in boats to Yakutsk, and thence to the Lena Delta, arriving at Bulun July 3. From this time until October 31 the party was engaged in making a careful search of the Lena Delta and of the adjacent coast as far as Olenek on the west and the Jana River on the east, a distance of over one thousand miles. Every part of the coast was thoroughly explored, and every effort made by personal inspection and by questioning the natives to find traces of the lost party, but without success.

By the Act approved August 7, 1882, Congress made an appropriation of \$25,000 to defray the expenses of removing and transporting to the United States the remains of Lieutenant-Commander George W. DeLong and his companions, eleven in all, and for their proper burial within the United States. Upon the same day instructions were sent by cable to St. Petersburg, to be forwarded thence to Lieutenant Harber, charging him with the execution of this duty. Being at that time occupied with the search in the Lena Delta, he only received the instructions upon his return to Yakutsk, November 29. The necessary permission from the Russian authorities was received at Yakutsk January 25, 1883. On the day following, Lieutenant Harber left Yakutsk for the Lena

Delta, and using all possible dispatch, returned with the remains on March 29. As the winter season was nearly over, during which alone the removal to Orenburg, the nearest railway point, could be effected, arrangements were made by Lieutenant Harber to remain at Yakutsk until the following season. As soon as winter travel is practicable, the bodies will be transported to Orenburg, and thence to the United States.

BUREAU REPORTS.

The reports of the chiefs of the Bureaus of the Department attest the intelligence and zeal with which all are laboring for the good management of the Department and the improvement of the naval service. Criticisms have at times been freely made of the bureau system, which upon consideration seem unfounded. All methods of subdivision of labor have their defects, but such, however, are indispensable in every large governmental or civil establishment. It may fairly be claimed that the organization of this Department into Bureaus whose chiefs represent and act only in the name of the principal head, as he in turn only executes the orders of the President as to all matters connected with the naval establishment, is the best that can be devised. Advisory Boards, whether organized by direction of law or on the motion of the Department, are unobjectionable so long as their functions are limited to giving advice or negating injurious action. But attempts to vest in them affirmative executive power, or to establish a Board of Admiralty to govern the Navy, would tend to destroy unity and vigor of action and would be no improvement upon the organization by Bureaus.

BUREAU OF YARDS AND DOCKS.

The recommendations of the Chief of the Bureau of Yards and Docks, Rear-Admiral Edward T. Nichols, for appropriations amounting to \$2,208,500 for the permanent improvement of the navy-yards and stations, although printed for information with the estimates, have not been formally submitted by the Department, for the reason that before making further appropriations for such permanent improvements, Congress should adopt a definite and complete plan, determining what yards shall be closed as working yards and what yards shall continue to be used for construction and repair, and how the latter shall be improved. In addition it has been stated earlier in this report that radical changes in methods of work in the construction and repair of vessels should be instituted if efficient and economical results are to be secured. These changes also should precede any large appropriations for permanent improvements.

The above views do not, however, justify the reductions made at the last session of Congress in the appropriations for the general maintenance and preservation of the yards. If any yard is to be closed it should be done by direct requirement of Congress, and not indirectly

by an arbitrary reduction of the appropriation for fuel, lights, watchmen, fire-enginemen, and other requisites for the preservation of the valuable property of the Government, which must be reasonably provided for, even at closed yards.

The recommendation of the last report for the sale of 53 of the 193 acres of the New York navy-yard, which was adopted by the House of Representatives, is renewed, and the sale of the naval hospital grounds should be included.

BUREAU OF EQUIPMENT AND RECRUITING.

The report of Commodore Earl English, Chief of the Bureau of Equipment and Recruiting, states the equipments of vessels which have been prepared, the coal purchases made, the hemp, hide, and wire rope, chain cables and anchors, galleys and ranges manufactured, and the enlistment of 5,064 of the 6,640 seamen of the Navy, effected during the year by the Bureau. It also recites the progress made in preparing Coaster's Harbor Island, in Narragansett Bay, for the headquarters of the training squadron for the naval apprentices, and advises an increase of the number of apprentices allowed by law from 750 to 1,000; which recommendation is concurred in.

BUREAU OF NAVIGATION.

The Chief of the Bureau of Navigation, Commodore John G. Walker, describes the operations of his Bureau and of the offices connected therewith, in relation to the improvement and testing of Navy compasses; the determination of longitudes, under Commander Francis M. Green, continued by Lieutenant-Commander Charles H. Davis; navigation supplies; the Naval Observatory; the hydrographic work of the Navy; the transit of Venus observations; and the Nautical Almanac.

The report recommends the erection of an inexpensive building, of non-magnetic materials, in which to test the compasses for the Navy. The necessity for such a building is now urgent, in view of the construction of steel cruisers, and of the prospective completion of the monitors.

Attention is again called to the importance of urging upon Congress the adoption of the revised International Regulations for preventing collisions at sea, thereby removing the confusion that now exists in consequence of the difference between the regulations of all other maritime nations and our own, which is likely at any time to cause a heavy loss of life and property.

NAVAL OBSERVATORY.

The Naval Observatory, since May 1, has been under the superintendence of Rear-Admiral Robert W. Shufeldt. His report treats in detail of the work performed during the past year with the several instruments; of the addition of a temperature room, for the more perfect testing of chronometers; of the examination and testing of other nauti-

cal instruments issued to the vessels of the Navy; of the transmission of time-signals; and of the reduction of the observations made by the astronomical expedition to Chili, and by the parties organized under the transit of Venus commission.

The report calls attention to the delays in the publication of the annual volume of "Astronomical and meteorological observations" caused by the lack of funds, and recommends a specific appropriation for printing the Observatory publications.

It is further recommended that provision be made for the appointment of a board of visitors, composed of a limited number of eminent astronomers, to examine annually into the condition of the Observatory, and advise with the superintendent upon the character of the work to be done, thereby removing many of the objections that are now urged against the administration of the institution. The Department concurs in the above suggestions, and it renews the recommendation made a year ago, that appropriation be made for the construction of the new observatory authorized by Act of Congress of February 4, 1880, for which, at a cost of \$63,000, a new site has been already purchased.

HYDROGRAPHIC OFFICE.

The officer in charge of the Hydrographic Office, Commander John R. Bartlett, narrates the work of the office in the preparation, correction, and issue of charts and sailing directions; the distribution of maritime information; the reduction of surveys made by naval officers in foreign waters, and the drawing, engraving, and printing of charts therefrom; the examination of the physical features of the ocean; and the collection and arrangement of meteorological information, obtained from naval and merchant vessels, for the construction of wind and current charts.

To meet the wants of the mercantile community, and to make information available at the earliest date, steps have been taken to issue a weekly pilot chart of the North Atlantic Ocean, containing the prevailing winds, currents, and reported dangers to navigation. A further improvement has been made by the detail of officers to represent the Hydrographic Office at the principal commercial ports, thereby making the information which it is the business of the office to distribute more accessible to shipmasters and others who need it, and enlarging the facilities of the office for collecting maritime information.

PUBLICATION OF THE NAVAL WAR RECORDS.

The naval records of the war, although not so voluminous as those of the Army, are equally important and valuable. It is desirable that provision should be made for continuing the work which has been already begun, of preparing these records for publication, and upon which, in the absence of such provision, no substantial progress can be made. It is especially important that steps should be taken without

delay to collect confederate documents which have passed into private hands, and which are likely in a short time to be lost or destroyed, by employing an agent for the purpose, as has been done with advantage by the War Department. It is therefore recommended that an appropriation be made at the coming session for the employment of a sufficient clerical force in connection with this work and of an agent for the collection of confederate documents.

OFFICE OF NAVAL INTELLIGENCE.

In order that the Department may be supplied with the fullest and most accurate information as to the progress of naval science in this and other countries, and the condition and resources of foreign navies, an Office of Naval Intelligence has been established for the collection and classification of such information, and for its publication, as far as may be advantageous and suitable. Two series of valuable reports or papers have been prepared by the office. Of the first or "War Series," giving accurate technical descriptions of naval operations in recent wars, there have been published one on the war between France and Tunis in 1881, and another on the South American war in 1879-1881; and a third, on the operations in Egypt in 1882, is in course of publication. The second series is devoted to general professional information. Of this there have been published an account of observations upon the Korean coast and in Siberia, and a report on the English Electrical Exhibition of 1882.

BUREAU OF ORDNANCE.

The Chief of the Bureau of Ordnance, Commodore Montgomery Sicard, recommends increased appropriations for the next fiscal year, and reports the progress made in preparing experimental high-power guns on both the hooped and the wire-wound systems; in improvements in powder for such guns; in gun-carriages; experiments upon armor plates with new steel projectiles; purchases of Hotchkiss revolving cannon and experiments with Gatling guns; the construction of gun-cotton spar-torpedoes, the manufacture of gun-cotton, the purchase of electric search-lights, and the instruction of naval officers in torpedo practice at the station at Newport, R. I., under the supervision of Captain Thomas O. Selfridge.

Difficulty has been experienced in procuring in this country steel forgings suitable for the large guns of the new cruisers and the monitor Miantonomoh. Opportunity has been given to all home manufacturers to furnish such forgings; some are being thus supplied, and some orders have been placed in England. It is the intention of the Department to have in readiness the batteries by the time of the completion of the vessels, and for this purpose to make such purchases abroad as may be necessary.

In pursuance of the directions of the Naval Appropriation Act of March 3, 1883, the President, on April 2, 1883, appointed Commodore

Edward Simpson, U. S. Navy; Capt. Edmund O. Matthews, U. S. Navy; Col. Thomas G. Baylor, Ordnance Department, U. S. Army; Lieut. Col. Henry L. Abbot, Engineer Corps, U. S. Army; Maj. Samuel S. Elder, Second Artillery, U. S. Army; and Lieut. William H. Jaques, U. S. Navy, a Board for the purpose of examining and reporting to Congress which of the navy-yards or arsenals owned by the Government has the best location and is best adapted for the establishment of a Government foundry; or what other method, if any, should be adopted for the manufacture of heavy ordnance adapted to modern warfare, for the use of the Army and Navy of the United States; and the cost of all buildings, tools, and implements necessary to be used in the manufacture thereof, including the cost of a steam-hammer or apparatus of sufficient size for the manufacture of the heaviest guns. The Gun Foundry Board has been diligently prosecuting its work, and has visited Europe for the purpose of fully observing foreign methods of producing heavy guns. Its report may be expected at an early date. In some form the Government should aid in providing the means of manufacturing in this country modern high-power cannon of such a character and in such numbers that we shall be to no extent dependent upon purchases in other countries.

BUREAUS OF CONSTRUCTION AND REPAIR AND OF STEAM ENGINEERING.

Chief Constructor Theodore D. Wilson, and the Acting Chief of the Bureau of Steam Engineering, Mr. William H. H. Smith, in their reports submit the estimates for the next fiscal year, including those for completing the new cruisers and the double-turreted monitors, and report the work upon the repairs of the hulls and machinery of vessels during the last year, and the present condition of the fleet. Both these officers discuss at length questions concerning the personnel of the respective corps, and also consider the recommendations of the Navy-yard Commission for the concentration of the work in the navy-yards, differing widely upon the last subject.

The views of the Chief Constructor are forcibly expressed and entitled to full examination. It is, however, beyond dispute that methods of naval construction must change with the transition from wooden to steel vessels. It will be found impossible for two independent and equal bureau chiefs to design and supervise the construction of a modern vessel, the one that of the hull, and the other that of the machinery, and bring all parts together in one perfect ship, without differences of opinion which cannot longer be safely decided by a common superior who does not possess technical skill. The true solution of the conflict is to unite these two bureaus as a single Bureau of Naval Construction, having for its chief the most competent naval architect that can be found, whether among the present officers of the Navy or in civil life.

BUREAU OF PROVISIONS AND CLOTHING.

By the report of Paymaster-General Joseph A. Smith, it appears that during the fiscal year the cost of the rations actually issued to crews and marines on board ships has been \$473,476.08, while the payments in money to crews, marines, and officers for commuted rations have been \$576,477.06, and that the proportion of such payments is increasing yearly. Commutation for enlisted men, although of doubtful legal authority, and only effected through the fiction by which the man is supposed to draw his rations and then sell them to the paymaster, has become practically unlimited, and results in the deterioration and final condemnation of many provisions. Authority of law is requested for the commutation of rations, to be limited and regulated by the Department.

Improvements in the quality of clothing for seamen have been effected under the present system of manufacture at the New York yard, and a reduction in the cost is contemplated by the Bureau. The Bureau is of opinion that the navy ration cannot be materially changed in quantity or quality unless its value shall be increased by Congress. This subject deserves consideration by an appropriate Board.

The law of March 3, 1881, regulating the purchase of tobacco, is objectionable, fixing arbitrarily, as it does, the time of purchase, requiring expensive advertising, the procuring of unnecessarily large quantities to deteriorate by storing, and otherwise taking away that reasonable discretion which should be vested in the Bureau. It should be repealed, and section 3721 of the Revised Statutes should be re-enacted.

BUREAU OF MEDICINE AND SURGERY.

The Surgeon-General, Medical Director Philip S. Wales, reports upon the health of the Navy, the physical examination of recruits, and the condition of the Naval Hospital Fund; calls attention to improvements in the method of obtaining supplies, in the dissemination of professional information to medical officers, and in the statistical reports showing the duration, variety, and distribution of disease in the naval force; and advises that increase be made in the appropriation for the repair and maintenance of hospitals, and for the employment of attendants, if the present system is to continue.

The report, however, states that the system is defective in that the hospitals are too large and expensive for present or prospective requirements, and it recommends the sale of those at Chelsea, Mass., Brooklyn, N. Y., and Philadelphia, Pa., the proceeds to be turned into the Naval Hospital Fund, from which the money was drawn to make the original purchases; the employment of the hospital at Washington for the purposes of the Museum of Hygiene; the erection of station hospitals of suitable size at the navy-yards, for acute cases of disease and those likely to be of brief duration; and the maintenance of the estab-

lishment at Norfolk, Va., as a general hospital for chronic and protracted cases, the naval laboratory being removed from Brooklyn to that place. The effect of this measure would be the substitution of one hospital fully equipped and occupied for seven that are now inadequately supported and only partially used. The hospital at Mare Island would necessarily be retained, as it is the only station on the Pacific coast.

MARINE CORPS.

Col. C. G. McCawley, commanding the Marine Corps, reports that his command is in an excellent state of efficiency and discipline; having October 1, 1883, 1,887 enlisted men; 883 on board ships in commission and 1,004 at shore stations. Appropriations should be made this year for the whole number of thirty second-lieutenants now authorized by law, the eight new appointees to come, as last year, from graduates of the Naval Academy. The size, character, and relations to the military establishment of the Marine Corps require that its commanding officer should be given the former rank of brigadier-general by a revival of section 1601 of the Revised Statutes.

NAVAL ACADEMY.

The condition of the Naval Academy is every way satisfactory. The discipline is strict but salutary and meets no resistance. The course of instruction and standard of scholarship are calculated to produce the most desirable results. The reports of the Board of Visitors of June 9, 1883, and of Capt. Francis M. Ramsay, Superintendent, are commended to the attention of all interested in the institution.

Of the naval cadets who completed their six years' course and finally graduated in June, 1883, the three highest were appointed assistant naval constructors and sent abroad for further instruction, and twenty others, selected in the order of merit, as required by the Act of August 5, 1882 were appointed in the lower grades of the line and Engineer Corps, and of the Marine Corps; seven as ensigns; three as assistant engineers, and ten as second-lieutenants in the Marine Corps. The remaining sixty-three, being surplus graduates, according to the act, were given each a certificate of graduation, an honorable discharge, and one year's sea pay, as therein directed.

Of the surplus graduates forty-one had been cadet-midshipmen and twenty-two cadet-engineers before the Act of August 5 changed their designation to naval cadets. The cadet-engineers claimed that at that date they were not undergraduates at the Academy, but were a permanent corps in the service, entitled to be retained therein at the end of their six years' course, notwithstanding the Act. They founded their claim upon some immaterial differences of language in the appropriation acts concerning the cadet-engineers and cadet-midshipmen. The opinion of the Department, however, was clear that both were in law and

fact undergraduates at the Academy and nothing more, until the end of their six years; and that the intention of Congress was plain to dismiss both as surplus graduates, and not to discharge the forty-one and retain the twenty-two, and therefore the claim of the latter was disregarded, and all were alike discharged. If the claim is persisted in, Congress should negative it by a new enactment. Equitably, if the twenty-two engineers have any claim the forty-one cadet-midshipmen have the same. But notwithstanding they may all be entitled to sympathy in their personal disappointment at not being required, as they expected, to serve the Government, there will be no justification for placing them for life upon a naval register already overcrowded with unemployed officers. The first annual pay of these sixty three graduates, and of an equal number next year, if unnecessarily admitted to the Navy, would be about \$160,000; to continue and the pay of each to increase during life.

REPORT OF THE ADMIRAL OF THE NAVY.

The report of the Admiral discusses with freedom and force a large range of naval subjects, his views upon which are commended to full attention.

NAVAL EXPENDITURES.

The appropriations applicable to the current expenses of the fiscal year ending June 30, 1883, were, as stated in the last annual report, \$15,575,858.98. From this sum should be deducted, as there explained, \$59,813 belonging to the Naval Asylum, and there should be added a balance on hand at the beginning of the year of \$1,814,532.57, on account of pay of the Navy and pay of the Marine Corps. The total gross amount, therefore, which was available for the year was \$17,330,578.55, still subject to a deduction of \$931,137.49, due to general account of advances, and of \$13.86 carried to the surplus fund.

The net amount, therefore, available for the year was.....	\$16,399,427 20
The expenditures were	13,918,833 78

Leaving a balance unexpended at the end of the year of.....	2,480,593 42
To this should be added the net amount unexpended in the hands of pay officers, as shown at the office of the Fourth Auditor.....	315,344 37

Showing the net expenditures for the fiscal year to have been.....	2,795,937 79
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less than the amount applicable therefor.

The available appropriations for the present fiscal year ending June 30, 1884, were \$14,205,247.23.

Amount drawn by warrant from the Treasury from July 1, 1883, to November 1, 1883.....	\$5,567,469 18
Refunded during the same period.....	571,941 10

The actual expenditures have been	4,995,528 08
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Being \$101,223.55 less than was expended during the same period of last year, and leaving available November 1, 1883, \$9,209,719.15.

ESTIMATES.

The estimates for the fiscal year ending June 30, 1885, are—

Pay of the Navy	\$6,932,605 00
Pay, miscellaneous.....	350,000 00
Coal, hemp, and equipment	956,000 00
Ordnance and Torpedo Corps.....	574,010 00
Pay of civil establishment of the navy-yards.....	198,989 75
Navigation and navigation supplies	229,000 00
New Naval Observatory.....	586,138 00
Repairs and preservation of vessels.....	1,750,000 00
Steam machinery	1,200,000 00
Provisions for the Navy	1,200,000 00
Medical Department.....	40,000 00
Repairs of hospitals.....	30,000 00
Naval Hospital Fund	30,000 00
Naval Academy.....	184,625 45
Contingent expenses of Department and Bureaus	223,000 00
Naval Asylum, Philadelphia.....	92,251 00
Maintenance of yards and docks.....	420,000 00
Repairs and improvements of navy-yards	400,000 00
Support of Marine Corps	927,688 56
Making for the ordinary purposes of the service	16,319,307 76

INCREASE OF THE NAVY.

Completing the new steel cruisers :

Hulls.....	\$921,500 00
Machinery	620,000 00
Equipment	113,000 00
Ordnance	449,027 00
Completing the four double-turreted monitors.....	2,923,654 62
Ordnance for the same and the Miantonomoh	1,073,000 00
Additional steel rifled breech-loading guns.....	599,400 00
Completing hulls of the New York and Mohican	400,000 00
Completing the machinery for the New York.....	100,000 00
Two clipper sailing vessels for the training squadron.....	100,000 00
Tools for navy-yards asked by Bureau of Construction.....	150,000 00
Making for the increase of the Navy	7,449,581 62

The appropriations of \$2,103,527 for completing the new cruisers should be made for the next fiscal year, but available during the present year if rapidity of construction requires their use. The appropriations of \$3,996,654.62 for completing the monitors, increased \$398,722 for a full ordnance outfit over the estimates of the Advisory Board, may, according to the discretion of Congress, be extended over more than one year; but authority to proceed with the work should be distinctly conferred.

COAST DEFENSES.

There is one measure of national defense in regard to which the argument cannot be made, as in the case of ships and guns, that modern discovery is likely to make such improvements in the art of construc-

tion that action might for the present be deferred. This is the creation of an interior coast-line of water-ways across the head of the peninsula of Florida, along the coast from Florida to Hampton Roads, between the Chesapeake Bay and the Delaware, and through Cape Cod. To these should be added a railroad from the mainland of Florida to Key West. To secure the combined commercial and military advantages which these avenues for merchant and naval vessels would afford, work should be immediately begun and deliberately and economically prosecuted, and not left to be done hastily and expensively in an emergency.

COALING STATIONS.

The United States should not be dependent upon the ports of the great naval powers for coal for the various squadrons in foreign waters. We have already established coaling stations at Honolulu, the Samoan Islands and at Pichilingue, in Lower California; and the Monongahela is being fitted for a store-ship at Callao to hold 1,000 tons of coal. Authority should be asked from Congress to fix the above stations on a firm basis, and to establish additional coaling and naval stations at some or all of the following points; Samana Bay, or some port in Hayti; Curaçao, in the Caribbean Sea; Santa Catharina, in Brazil; the Straits of Magellan; La Union, in Salvador, or Amapala, in Honduras; Tullear Bay, in Madagascar; Monrovia, in Liberia; the Island of Fernando Po; and Port Hamilton, in the Nan-how Islands of Corea; from which latter naval station and the ports of Corea there should be established a regular line of steamers carrying the United States flag, connecting with the present American line between San Francisco and Japan. Similar stations should in addition be maintained, one at the best point on the Atlantic side of the Isthmus of Panama, and another at the Islands of Flamenco, Perico, Culebra, and Ileña on the Pacific side, now owned by American corporations.

EMPLOYMENT OF THE NAVY IN ALL NATIONAL WORK ON THE OCEAN.

In the report from this Department of last year it was affirmed as a broad and salutary principle of administration that the officers and seamen of the Navy should be employed to perform all the work of the national Government upon or in direct connection with the ocean. It was shown that such an extension of the field of naval employment would strengthen and invigorate the service without any detriment to existing interests, while the fusion of all branches of nautical administration would secure concentration of purpose, unity of action, and broader and more substantial results.

The reasoning upon which this proposition is based is simple and obvious. The United States have an ocean commerce of 2,500,000 tons and a sea-coast of 10,000 miles. Though the carrying trade has fallen largely into foreign hands, yet in maritime tonnage our country is still the second, and in extent of coast-line the third, in the world. Upon our

coast lie more than twenty great cities, the centers of distribution for the products of the interior. What affects them affects the whole country. The only safeguard for these important and vulnerable interests lies in the Navy. To dispense with a navy would be to invite aggression and to ensure disaster.

The Navy, as an arm of maritime defense, is therefore a national necessity. It must be maintained continuously for two purposes: to avert war, by making it costly and dangerous for an opponent; and to wage war, when it cannot be averted. From the nature of things, however, the fulfillment of these purposes cannot of itself give the naval force full and continuous employment. Nevertheless, it must be maintained, and maintained in a state of efficiency. Although the contingency that will call it into full activity is remote, its officers must always be kept in readiness. If they cannot be, it would be better, for the country's interest as well as for their own, that they should be disbanded.

There is only one way in which the people can assure themselves that their Navy shall be always thus prepared for service. It must be constantly occupied to the full measure of its capacity; its occupations must be directly in the line of its profession; and they must be carried on under the supervision of that Department which is responsible for its efficiency and discipline. If it were necessary, in order to effect this, that new work should be devised for the Navy to do, the result would be sufficiently important to warrant the undertaking. But it is not necessary. The Government is to-day performing, by means of other officials and other establishments, work which, in its general professional character and in the professional training required, is indistinguishable from that of the Navy itself. A sound policy demands that in it the Navy should be utilized, occupied, and practiced.

This nautical work now carried on by the Government outside of the Navy Department comprises the surveying and lighting of the coast and its adjacent islands; the prohibition of illicit trade, the assistance of vessels in distress, and the rescue of life and property from the perils of the sea; the inspection of the hulls and boilers of merchant steamers, with a view to their safe navigation; and the admeasurement and registration of vessels and the shipment and care of seamen of the merchant marine. The measures proposed by the Department consisted in the application to this unquestionably nautical work of the general principle advocated, and in its extension in the same direction by an organized and practical effort to supervise and advance the interests of our decayed merchant marine.

In applying the general principle to the nautical work within the province of the Government, it is found that one portion, the supervision of commerce by a single branch of the executive, though highly important and desirable, is not in operation at all; that a second portion, the shipment of seamen, is carried on by subordinate officials under no executive supervision; that a third portion, the survey-

ing and lighting of the coast, is done almost wholly by officers of the Navy, under the direction of the Treasury Department; while a fourth portion, consisting of the cutter service, the life-saving service, and the steamboat inspection, is also committed to bureaus in that Department, and is performed by officials connected therewith. In reference to the supervision of commerce and the shipment of seamen, the question whether they shall be directed by any Department, and, if so, by that of the Navy, is one that may be determined on its merits, without regard to existing relations. In reference to the Coast Survey, it is clear that the present arrangement, by which the direction and control of a large body of naval officers and seamen are transferred to the Treasury Department, is unsuitable, unnecessary, and detrimental to the interests of the Government. As to the rest of the work, which is now wholly carried on by the same Department, while no criticism is made upon the integrity or efficiency of its administration in any particular under the system adopted, yet the expediency of the system itself becomes a general question of national policy, which, not alone in its bearing upon the useful employment of the Navy, the Navy Department is competent and is called upon to consider.

In pursuance of this duty, and after careful inquiry and mature reflection, the Department, in its report of last year, recommended that the Navy should be employed, as far as was possible, to perform all this maritime work; and it suggested a process by which the transfer might be accomplished without any interruption of the operations of the Government. The views then expressed have only increased in strength, as added experience and discussion have thrown new light upon them. The main points of the argument are therefore restated, and the recommendations are emphatically renewed.

THE LIGHT-HOUSE BOARD.

The Light-House administration, charged with the establishment and care of aids to navigation, including light-houses, light-ships, beacons, buoys, fog-signals, and sea-marks, performs a work under the Treasury Department which is strictly nautical in character; of which no one but a practical navigator is a competent judge; which requires a kind of skill and experience that the Navy alone can furnish; and all the essential parts of which, excepting only the erection and repair of buildings and apparatus, are carried on at this time by naval officers. Being nautical and not fiscal operations, they should be supervised by the Navy and not the Treasury Department.

THE COAST SURVEY.

The Coast Survey, originally established for the purpose of making hydrographic charts, has of late years extended its functions in a totally different direction, that of geodetic surveys in the interior. In making this extension, it has gradually abandoned the water survey to the Navy,

until now the actual work in this field is done almost exclusively by naval officers withdrawn for the purpose from the direction and control of their own Department. By an extraordinary anomaly in legislation, the United States Hydrographic Office, an indispensable branch of this Department, is allowed to survey and make charts of every coast in the world but that of the United States; while the best naval surveyors are claimed by another Department to perform this work under its supervision. Sixty-seven naval officers are now diverted in this manner from the direction of the Navy; and 280 seamen, out of the 7,500 allowed to the Navy, are now on board Coast Survey vessels.

For such an arrangement there might be some show of reason if the work upon which the officers are engaged were specially connected with the Department under which they are placed, and remote from the subjects of which their own Department has cognizance; but, in view of the fact that no part of this work has the faintest traceable connection with the general purposes of the Treasury, that its effectual performance is of vital importance to the Navy, and that an office exists to-day in the Navy Department where similar work is necessarily carried on, it is inconceivable why so inconvenient, artificial, and indefensible an arrangement should be perpetuated. The existing office might properly continue the geodetic work, which seems gradually to be absorbing its attention and its appropriations, while the hydrographic surveys on our coast, now performed by naval officers, under a naval inspector, in the office of the Geodetic Survey, should be carried on, like other hydrographic surveys, by the Naval Hydrographic Office.

THE REVENUE MARINE AND THE LIFE-SAVING SERVICE.

The duties of the Revenue Marine, as officially defined, consist in cruising for the prevention of illicit trade, and for the enforcement of certain laws applicable to shipping, particularly those requiring the registry, enrollment, and license of vessels, compelling life-saving appliances to be kept therein, the name and hailing port to be affixed, and lights to be exhibited; prohibiting the overloading of passengers, assessing the marine-hospital tax, and aiding in the quarantine service of the States. The cutters further assist in enforcing the neutrality laws, and those for the suppression of piracy, and for the protection of the timber reserves. They are also called upon to prevent unlawful traffic in rum and fire-arms in Alaska; to protect the seal-fisheries, to suppress mutinies and extinguish fires on board merchant-vessels, and to carry out the laws in aid of distressed seamen.

Several of these duties, such as the enforcement of the neutrality laws, the suppression of piracy, of mutinies on board merchant-vessels, and the like, the ships of the Navy are now charged with and actually perform in common with revenue vessels. Of the rest, there is not one that is foreign to the general purpose and scope of the naval officer's profession. The only duty connected directly with the customs is that

of the seizure of smugglers—a duty which is precisely similar to the naval officer's duty of searching and seizing, during war, vessels engaged in contraband trade. It requires a knowledge of the statutes relating to the subject, a knowledge not very difficult to acquire; but beyond this nothing that is outside of a naval officer's necessary training. The duties of both services are identical in their general nature, only they operate in different localities. Both cruise to protect the maritime interests of the Government, and to render assistance to American vessels—the one on the coast, the other, in addition, at sea and in foreign waters. One polices the shore, the other the ocean. In war both engage in naval operations.

The practical identity in the character of the Naval and the Revenue-Marine Services lies in the fact that they are both nautical and both military. That the Revenue Marine is a nautical service requires no proof. It is nothing if not nautical. That it is a military service was officially asserted by the Treasury Department in the report on the service for 1881, in these words:

“The Revenue Marine, while charged by law with the performance of important civil duties, is essentially military in its character. Each vessel is provided with great guns, and furnished with as full a complement of small arms for its crew as any ship of war. Its officers are required to be proficient in military drill, and possess a thorough knowledge of the uses of both great and small arms. Its crews are required to be instructed from day to day at the great guns and in the use of the carbine, pistol, and cutlass. Commanding officers are required, while boarding vessels arriving in ports of the United States, in case of the failure or refusal of any such vessel, on being hailed, to come to and submit to the proper inspection by an officer of the service, to fire, first across her bows as a warning, and, in case of persistent refusal, to resort to shot or shell to compel obedience. In the performance of this work, they are likely at any time to receive injuries, and be subjected to the same dangers in time of peace as the force employed on naval vessels.

“By the Act of March 2, 1799, it is provided that ‘the revenue cutters shall, whenever the President so directs, co-operate with the Navy.’ It will be observed that the co-operation of the two services prescribed in the act above quoted is not contingent upon a state of war or other particularly perilous conditions. On the contrary, it may take place in time of peace and for pacific purposes, and when less hazard is involved to the two services than pertains to the discharge by a revenue vessel of its ordinary duties. * * It is difficult to conceive that discrimination could be made by the law between services subjected to equally hazardous and equally important military duties, both in time of peace and in time of war. * * Objection to granting pensions for the revenue-marine officers and seamen has been made, on the ground that such action would be extending this bounty to civil employés of the Government, a policy to which our legislative traditions, so to speak, are opposed. But, if in legal theory they are civil employés, are they so in fact? Are they less positively a part of our military force in time of war than the Army or Navy? It is true, revenue vessels are not to be ordered into action on purely military service, offensive or

defensive, except the President so direct; neither are vessels of the Navy."

The above clear and precise statement, showing that the so-called Revenue Marine is simply a coast navy, is without doubt correct and just, notwithstanding that the same subordinate in the Treasury Department who formulated it for official communication to Congress, now makes the following assertion, though not, as it appears, with the endorsement of the Secretary:

"The fact is, the business of the Revenue-Marine officer is as distinct from that of a naval officer as one land service is from another. The military drill and instruction of the Revenue-Marine officer do not necessarily make him a naval officer any more than the present education of a naval officer fits him to manage vessels in harbors and along the shoal waters of the coast."

Whether the views put forth in 1881, or the exactly opposite views emanating from the same person in 1883, are correct, and whether the service is to be considered as military or not, it is still unquestionably nautical; and it is for this reason that it comes within the scope of the general principle now advocated. It is because it forms a part of Government work in which officers and seamen are employed to navigate Government vessels, at sea, from port to port, that it may fitly become a part of the naval establishment. If the present system of military instruction is so defective that the officers of the revenue navy are not made naval officers, it would seem that some other system should be adopted to that end, seeing that they are "subjected to equally important and equally hazardous military duties, both in time of peace and in time of war," and that they are no less positively "a part of our military force in time of war than the Army or Navy." If, on the other hand, naval officers now have too little practice in coast navigation, a method should be devised of giving them such practice at once, for there is nothing more essential than this to success in the operations of modern warfare.

The plan proposed with these objects in view included the transfer to the Navy Department of the cruising cutters, their officers and seamen, (excepting the harbor boats used by the inspectors of customs, which do not require a special corps of officers); the organization of the officers transferred, as a Revenue-Marine Corps in the Navy, upon a footing precisely similar to that of the present naval officers; and the gradual employment of junior officers of the Navy in this service, as vacancies occur at the bottom of the list. Such a measure would accomplish the desired result while protecting effectually the interests of the existing corps.

The Live-Saving Service, being closely connected with the Revenue Marine, and being equally work of a nautical character, would necessarily follow the latter. The objection which has been suggested that naval officers are not surfmen, applies with equal force to officers of the Revenue Marine. It is obvious that one branch may be utilized in this

service as readily as the other. The objection that a necessary incompatibility exists between naval officers as such, and professional surfmen, which is not to be found in the relations to the latter of Revenue-Marine officers, requires no answer. The transfer of the service involves no displacement of the crews of life-saving stations; nor can any reason be adduced why they should not perform as good work in saving life endangered by the sea, under a department charged with nautical matters, as under one whose appropriate functions are the collection and disbursement of the revenue, the issue of the currency, and the regulation of the national debt.

THE BUREAU OF MERCANTILE MARINE.

In view of the close and essential connection between the Navy and the Mercantile Marine, it was further proposed to establish a Bureau of Mercantile Marine in the Navy Department, which should be charged with those branches of administration requiring a professional knowledge of the men and materials employed in commercial navigation. Such a bureau would include the registry, enrollment, and license of vessels, their admeasurement for tonnage, the inspection of steam vessels, and the shipment and care of seamen. It should further be made the business of the proposed bureau, aided by a board representing the principal maritime and commercial interests, to exercise such care and supervision over these interests as would tend to a recovery of our carrying trade, and in general to the prosperity of our rapidly decaying merchant marine. The time has arrived when such a central administration is a necessity, as the merchant marine cannot prosper while its governmental regulation remains in the present chaotic condition. Whether its regulation should be intrusted to this or to another existing department, or to a new department created for it, is still an open question.

The first plan was advocated upon three distinct grounds: first, that much of the work requires a special technical knowledge which it is the business of the Navy Department to have always at command; secondly, that as the Navy is now charged with the protection and assistance of our shipping interests abroad, it might be wisely connected with the promotion of these interests at home; and, finally, that as the merchant marine must always afford the sole reserve upon which, in emergencies, the Navy can draw to recruit its strength, the interests of the two are inseparably united.

The recommendations made in the report of last year were followed by considerable discussion, of which a brief notice may fitly be taken. In some of the remonstrances presented by commercial and other organizations the various subjects were so confused and distorted, and the general purpose of the recommendations was so entirely ignored that the objections failed to have a bearing upon the actual merits of the question

Other remonstrances were notoriously procured by persons who are supported and given undue importance by the existing system, and who were alarmed lest change should destroy their occupations. In many instances the representations were not full or deliberate expressions of the opinion of the bodies whose names were used. Notably was this case with the resolutions of the Chamber of Commerce of New York, where the mover of an adverse resolution became himself the chairman of the committee to which the consideration of the measures was referred, and secured the adoption of a substantially similar resolution by a vote of only 17 out of 740 members of the Chamber.

Few of the arguments adduced by interested parties seem to have force against the broad general proposition that the direction of these nautical subjects should be united, and that the nautical department of the Government should carry on the work. The greater portion of them were based upon harsh criticisms of the past management of the Navy Department, and of the conduct of officers and seamen of the Navy. To these no rejoinder will be here engaged in, for an obvious reason. The question whether, as a permanent assignment, any particular subject-matter most appropriately belongs to one department or to another, must be settled on its merits, upon the assumption that both departments either are or will be ably and honestly conducted. Integrity and capacity in executive business are not the exclusive possession of any one branch of the Government, or of any one body of officials. To say that naval officers cannot wisely be employed on board the cruising cutters, whose principal use has no relation to the appropriate business of the Treasury Department, because occasionally dutiable articles have been brought home in naval vessels, is as unreasonable as to argue that the supervising inspectors should not inspect steam-vessels, because, in spite of their honesty and ability, terrible explosions of boilers have taken place directly after their most rigid examinations and unqualified certificates of approval. The real point in the present question, from which Congress should not be diverted by interested clamor, is: Ought these kindred branches of the public service to be united; and under which of the two departments, when both are well managed, should they be most naturally and appropriately conducted?

To stigmatize naval officers as idlers who are seeking to obtain an undue share of the civil administration is as unjust as it is illogical. If naval officers are idlers, it is because idleness is enforced upon them by a system which excludes them from the occupations for which they are peculiarly fitted. The remedy lies in giving them the employment which the naval service proper, in time of peace, cannot from its very nature fully afford. If they desire to obtain such employment, the desire is worthy and commendable. In the present case, the charge against them of encroachment is without foundation; since the recommendations in this report have been made, not at the instance or solicitation of officers of the Navy, but, upon a careful consideration, by the head of the Department, of the principles that should govern their employment.

If the Navy Department has not been wisely, economically, and energetically administered, and if naval officers have their faults or their vices, thorough reforms should be instituted, and such have been and will be unsparingly recommended and carried out. If they cannot be effected under the present distribution of executive powers, and if, on the other hand, the management of nautical affairs is an appropriate attribute of fiscal administration, then the existence of a separate nautical department is an error which should be rectified by placing the Navy under a bureau in the already comprehensive Department of the Treasury. But whether attached to one or to the other, all branches of nautical administration should be united. As well might the various parts of financial work be scattered among different departments as the fragments of nautical work be separated into an ocean navy here and a coast navy there; a survey of foreign coasts under one department and a survey of our own under another; a bureau and an engineer corps for the engines of naval steamers, and another bureau and another engineer corps for those of merchant steamers. Wherever the direction of nautical affairs is placed, all its branches should be under a common head, and should work with a common purpose.

One general argument has been presented against the transfer, in the form of an objection to employing military officers in civil duties. This is wholly out of place when applied to the army or navy of a popular government in a law-abiding community. In a despotism, where a standing army is maintained without the consent of the people and may be used for the repression of liberty, it would be wise to resist the extension of military employment to civil labors, even though the saving of expense should partly balance the evils resulting from an increase of despotic control. But in the United States the Army and Navy are the creation of the popular will. They are organized and supported only because the people deem them necessary for national existence and safety, and they can be disbanded at the pleasure of the people. They are equally with all other officials under the direction of a civil administration. They can therefore be wisely and safely employed in any work that will not impair their efficiency or discipline, and where their employment would save money that would otherwise be paid to maintain an unnecessary civil establishment. They should by all means be so employed when the service will not only relieve and benefit the people, but will add to the professional experience and to the fitness for war duties of the officers and men. Their exclusion can only be justified on the theory that to render them harmless they must be rendered inefficient; a theory which, if carried out, would result in the immediate abolition of the service.

The argument in favor of the full use of the Navy in all appropriate labors of peace becomes stronger as the nation seems more unlikely to engage in actual warfare. Our international policy tends to peace with

all the world; our conflicts will be infrequent; and therefore more than all other nations we should utilize our officers, seamen, and ships in the nautical works which peace-times require. Such are their appropriate sphere, not for their private benefit, but for the greater good of the Government to which they desire to give the fullest possible service.

In presenting its recommendations last year, the Department made every effort to mature its opinion by the fullest and most exhaustive examination of the subject. Had it done otherwise it would have fallen short of its duty. The question has a vital bearing upon the improvement of the Navy, and is in no way dependent upon the character of administration for the time being in this or that department. It is a broad question of permanent policy and statesmanship. In such a spirit it has been dealt with here. It is not, perhaps, to be expected that such an extensive change will commend itself, at the first inspection, to the community and to Congress while those who live upon the existing system are seeking, by denunciatory methods, to create an unfavorable public sentiment. But it is believed that the advantages of the change, when impartially examined, will be recognized, and that it must ultimately be made. In such a confident belief the Department renews its recommendations, basing them not upon an appeal to popular prejudice, or upon recriminations, as odious as they are irrelevant, respecting the conduct of other branches of the public service, but upon a calm and candid consideration of the whole question, in the interests of a sound administrative policy, and of the efficiency of the naval arm of the Government as closely connected therewith.

THE MERCHANT STEAM MARINE.

Too much prominence cannot be given to the fact that our naval progress must depend upon the revival of our merchant steam marine. The profitable carrying trade of the world is performed not merely in large and fleet modern screw-steamers, but in such steamers forming regularly established lines, with fixed hours of departure and almost of arrival, to all the great coast cities of both hemispheres. In this business we hardly participate at all, except on the Pacific Ocean. Our steam communication with South America and Europe is carried on by vessels under the flag of our commercial rivals. Persistence in a policy which gives such results is discreditable in a nation adapted by its resources, traditions, and the disposition of its people to be a great maritime state. This we can never again become with only a coast-wise traffic protected by the enforced exclusion of all except our own ships. We should immediately commence the establishment of steamship lines to South America and across the North Atlantic Ocean. The longer we delay the more difficult and expensive will be the work. To enable our capitalists, merchants, and shipowners, in the beginning, to meet successfully the cheap capital and labor of Europe which have established the foreign lines, the assistance of our Government is essen-

tial and should be rendered upon the same principle and method as have been adopted for the development of our landed possessions; namely, the payment, upon whatever routes the national interests may require to be established, of such compensation for carrying the mails of the United States as will secure the commencement and continuance of the service. Contracts for such compensation, for terms of years, awarded to the lowest bidders, after full public competition, would soon give us a fleet of modern ocean steamships of the highest power and capacity, improving our home industries, extending our foreign trade, elevating the national power and dignity and forming for any emergency a most important part of our naval force.

WILLIAM E. CHANDLER,

Secretary of the Navy.

APPENDIX.

No. 1.—ESTIMATES AND APPROPRIATIONS.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1885, by the Navy Department.

Detailed objects of expenditures, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
SALARIES, OFFICE OF THE SECRETARY OF THE NAVY.		
Secretary.....	\$8,000	
Chief clerk.....	2,500	
Disbursing clerk.....	2,250	
Four clerks of class four.....	7,200	
Three clerks of class three.....	4,800	
One stenographer.....	1,600	
Two clerks of class two.....	2,800	
Six clerks of class one.....	7,200	
Four clerks, at \$1,000.....	4,000	
One telegraph operator.....	1,000	
One carpenter.....	1,000	
Two messengers.....	1,680	
Three assistant messengers.....	2,160	
One messenger boy.....	420	
One telegraph messenger boy.....	240	
Three laborers.....	1,980	
One clerk of class two and one laborer (for inspection board).....	2,060	
One clerk of class two (for examining and retiring board).....	1,400	
One clerk of class one and one assistant messenger (in care of library).....	1,920	
	54,210	\$54,210
CONTINGENT EXPENSES.		
Stationery, furniture, newspapers, and miscellaneous items.....	5,000	
SALARIES, OFFICE OF THE JUDGE-ADVOCATE-GENERAL.		
One clerk of class three, appropriated March 3, 1883*.....	1,600	
Two clerks of class one, appropriated March 3, 1883*.....	2,400	
One clerk, appropriated March 3, 1883.....	1,000	
One laborer, appropriated March 3, 1883.....	660	
	5,660	5,660
CONTINGENT EXPENSES, NAVY.		
Contingent expenses of the Navy, namely: Rent and furniture of buildings and offices not in navy-yards; expenses of courts-martial and courts of inquiry, boards of investigation, examining boards, with clerks' and witnesses' fees, and traveling expenses and costs; stationery and recording; expenses of purchasing-paymasters' offices at the various cities, including clerks, furniture, fuel, stationery, and incidental expenses; newspapers and advertising; foreign postage; telegraphing, foreign and domestic; telephones; copying; care of library; mail and express wagons, and livery and express fees, and costs of suits; commissions, warrants, diplomas, and discharges; relief of vessels in distress, and pilotage; recovery of valuables from shipwrecks; quarantine expenses; care and transportation of the dead; reports, professional investigations, and information from abroad, and all other emergencies and extraordinary expenses arising at home or abroad, but impossible to be anticipated or classified.....	\$100,000 00	\$100,000 00

* One clerk of class two (\$1,400), submitted.

Estimates of appropriations required for the service of the fiscal year, &c.—Continued.

Detailed object of expenditures, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
PAY MISCELLANEOUS. For two secretaries, one to the Admiral and one to the Vice-Admiral, clerks to paymasters' clerks at inspections, navy-yards, and stations, and extra pay to men enlisted under honorable discharge; commission and interest, transportation of funds, exchange, mileage to officers while traveling under orders in the United States, and for actual personal expenses of officers while traveling abroad under orders, and for traveling expenses of apothecaries, yeomen, and civilian employés; and for actual and necessary traveling expenses of naval cadets while proceeding from their homes to the Naval Academy for examination and appointment as cadets, and for payment of any such officers as may be in service, either upon the active or retired list, during the year ending June thirtieth, eighteen hundred and eighty-five, in excess of the numbers of each class provided for in this act, and for any increase of pay arising from different duty, as the needs of the service may require, three hundred and fifty thousand dollars.....	\$350,000 00	\$300,000 00

Estimate of the amount required to pay the officers of the United States Navy for the fiscal year ending June 30, 1885.

Grade.	Sea duty.			Other duty.			Waiting orders.		
	No.	Pay per annum.	Total.	No.	Pay per annum.	Total.	No.	Pay per annum.	Total.
Admiral	1			1	\$13,000	\$13,000			
Vice-Admiral	1			1	8,000	8,000			
Rear-admiral, chief of Bureau	1			1	5,000	5,000			
Rear-admiral	4	\$6,000	\$24,000	2	5,000	9,000	1	\$4,000	\$4,000
Commodores, chief of Bureau	1			1	5,000	5,000			
Commodores	2	5,000	10,000	12	4,000	48,000	7	3,000	21,000
Captains, chief of Bureau				2	5,000	10,000			
Captains	10	4,500	45,000	25	3,500	87,500	10	2,800	28,000
Commanders	24	3,500	84,000	43	3,000	129,000	20	2,300	46,000
Lieutenant-commanders, second 5 years	17	3,000	51,000	21	2,600	54,600	5	2,200	11,000
Lieutenant-commanders, first 5 years	16	2,800	44,800	11	2,400	26,400	8	2,000	16,000
Lieutenants, second 5 years	100	2,600	260,000	86	2,200	189,200	22	1,800	39,600
Lieutenants, first 5 years	35	2,400	84,000	21	2,000	42,000	8	1,600	12,800
Lieutenants (junior grade), second 5 years	13	2,000	26,000	14	1,700	23,800	5	1,400	7,000
Lieutenants (junior grade), first 5 years	36	1,800	64,800	20	1,500	30,000	7	1,200	8,400
Ensign, second 5 years	13	1,400	18,200	11	1,200	13,200	2	1,000	2,000
Ensign, first 5 years	50	1,200	60,000	12	1,000	12,000	7	800	5,600
Ensign, junior grade	70	1,000	70,000	16	800	12,800	12	600	7,200
Naval cadets	73	950	69,350	2	500	1,000	30	500	15,000
Medical director, chief of Bureau				1	5,000	5,000			
Medical director, after 20 years				10	4,000	40,000	4	3,000	12,000
Medical inspectors, after 20 years				3	4,000	12,000	1	3,000	3,000
Medical inspectors, fleet	4	4,400	17,600						
Medical inspectors, fourth 5 years				6	3,600	21,600	1	2,800	2,800
Surgeons, fleet	1	4,400	4,400						
Surgeons, fourth 5 years	3	3,700	11,100	6	3,600	21,600	1	2,800	2,800
Surgeons, third 5 years	5	3,500	17,500	4	3,200	12,800	3	2,600	7,800
Surgeons, second 5 years	3	3,200	9,600	5	2,800	14,000	4	2,400	9,600
Surgeons, first 5 years	6	2,800	16,800	7	2,400	16,800	2	2,000	4,000
Passed assistant surgeons, after 5 years	37	2,200	81,400	27	2,000	54,000	9	1,700	15,300
Passed assistant surgeons, first 5 years	1	2,000	2,000	5	1,800	9,000			
Assistant surgeons, first 5 years	4	1,700	6,800	4	1,400	5,600			
Assistant surgeons (not in line of promotion)				2	{ 1,800 } 1,600	3,400			
Pay directors, after 20 years				6	4,000	24,000	5	3,000	15,000
Pay directors, fourth 5 years				1	3,600	3,600	1	2,800	2,800
Pay inspectors, chief of Bureau				1	5,000	5,000			
Pay inspectors, fleet	3	4,400	13,200						
Pay inspectors, after 20 years				4	4,000	16,000	2	3,000	6,000
Pay inspectors, fourth 5 years				3	3,600	10,800			
Paymasters, fleet	2	4,400	8,800						
Paymasters, fourth 5 years	3	3,700	11,100	8	3,600	28,800	4	2,800	11,200
Paymasters, third 5 years	3	3,500	10,500	6	3,200	19,200	1	2,600	2,600

Estimate of the amount required to pay the officers of the United States Navy for the fiscal year ending June 30, 1885—Continued.

Grade.	Sea duty.			Other duty.			Waiting orders.		
	No.	Pay per annum.	Total.	No.	Pay per annum.	Total.	No.	Pay per annum.	Total.
Paymasters, second 5 years	1	\$3,200	\$3,200	7	\$2,800	\$19,600	5	\$2,400	\$12,000
Paymasters, first 5 years	4	2,800	11,200	4	2,400	9,600	1	2,000	2,000
Passed assistant paymasters, second 5 years	7	2,200	15,400	3	2,000	6,000	4	1,700	6,800
Passed assistant paymasters, first 5 years	8	2,000	16,000				7	1,500	10,500
Assistant paymasters, first 5 years	4	1,700	6,800	8	1,400	11,200	8	1,000	8,000
Chief engineer, chief of Bureau				1	5,000	5,000			
Chief engineer, fleet	6	4,400	26,400						
Chief engineer, after 20 years				17	4,000	68,000	4	3,000	12,000
Chief engineers, fourth 5 years	2	3,700	7,400	2	3,600	7,200			
Chief engineers, third 5 years	6	3,500	21,000	6	3,200	19,200	3	2,600	7,800
Chief engineers, second 5 years	1	3,200	3,200	3	2,800	8,400	4	2,400	9,600
Chief engineers, first 5 years	7	2,800	19,600	3	2,400	7,200	5	2,000	10,000
Passed assistant engineers, second 5 years	30	2,200	66,000	21	2,000	42,000	24	1,700	40,800
Passed assistant engineers, first five years	9	2,000	18,000	8	1,800	14,400	1	1,500	1,500
Assistant engineers, second 5 years	12	1,900	22,800	10	1,600	16,000	3	1,200	3,600
Assistant engineers, first 5 years	30	1,700	51,000	20	1,400	28,000	3	1,000	3,000
Chaplain, second 5 years	5	2,800	14,000	5	2,300	11,500	9	1,300	11,700
Chaplain, first 5 years	4	2,500	10,000				1	1,600	1,600
Professors, after 20 years				4	3,500	14,000			
Professors, third 5 years				2	3,000	6,000			
Professors, second 5 years				3	2,700	8,100			
Professors, first 5 years				2	2,400	4,800			
Naval constructor, chief of Bureau				1	5,000	5,000			
Naval constructor, fourth 5 years				4	4,000	16,000			
Naval constructor, third 5 years				6	3,700	22,200			
Assistant naval constructor, after 8 years				4	2,600	10,400			
Assistant naval constructor, first 4 years				3	2,000	6,000	2	1,500	3,000
Civil engineers, second 5 years				4	2,700	10,800			
Civil engineers, first 5 years				5	2,400	12,000	1	1,500	1,500
Secretaries to Admiral and Vice-Admiral				2	2,500	5,000			
Boatswain, after 12 years	7	1,800	12,600	9	1,600	14,400	11	1,200	13,200
Boatswain, fourth 3 years	3	1,600	4,800	6	1,300	7,800	1	1,000	1,000
Boatswain, third 3 years	1	1,400	1,400				1	900	900
Boatswain, second 3 years	1	1,300	1,300	3	1,000	3,000	2	800	1,600
Boatswain, first 3 years	4	1,200	4,800				1	700	700
Gunners, after 12 years	9	1,800	16,200	16	1,600	25,600	11	1,200	13,200
Gunners, fourth 3 years	1	1,600	1,600	4	1,300	5,200	2	1,000	2,000
Gunners, third 3 years	3	1,400	4,200	1	1,300	1,300			
Gunners, first 3 years	1	1,200	1,200						
Carpenters, after 12 years	5	1,800	9,000	7	1,600	11,200	8	1,200	9,600
Carpenters, fourth 3 years	3	1,600	4,800	7	1,300	9,100	5	1,000	5,000
Carpenters, third 3 years	2	1,400	2,800	1	1,300	1,300	1	900	900
Carpenters, second 3 years	5	1,300	6,500	1	1,000	1,000	3	800	2,400

Carpenters, first 3 years	2	1,200	2,400	3	900	2,700	7	1,200	8,400
Sailmakers, after 12 years	5	1,800	9,000	5	1,600	8,000	1	1,000	1,000
Sailmakers fourth 3 years	2	1,600	3,200	4	1,300	5,200	2	900	1,800
Sailmakers, third 3 years	4	1,400	5,600	3	1,300	3,900	1	800	800
Sailmakers, second 3 years				1	1,000	1,000			
Sailmakers, first 3 years	2	1,200	2,400				5	500	2,500
Mates	5	900	4,500	28	700	19,600			
Naval cadets (at Naval Academy)				190	500	95,000			

Estimate of amount required to pay officers of the Navy on the retired list for 1884-1885.

Grade.	Num-ber.	Pay.	Amount.
Rear-admirals	36	\$4,500	\$162,000
Do	5	3,750	18,750
Do	2	3,375	6,750
Commodores	12	3,750	45,000
Do	4	3,375	13,500
Do	2	2,625	5,250
Do	1	1,950	1,950
Do	1	1,150	1,150
Captains	2	3,375	6,750
Do	3	2,625	7,875
Do	1	2,250	2,250
Do	2	1,950	3,900
Do	1	1,150	1,150
Do	2	900	1,800
Commanders	6	2,625	15,750
Do	1	2,100	2,100
Do	1	1,750	1,750
Do	1	1,400	1,400
Do	1	1,150	1,150
Do	2	900	1,800
Lieutenant-commanders	7	2,250	15,750
Do	3	2,100	6,300
Do	1	1,900	1,900
Do	1	1,500	1,500
Do	2	1,100	2,200
Do	1	1,000	1,000
Do	1	700	700
Lieutenants	11	1,950	21,450
Do	1	1,800	1,800
Do	1	1,300	1,300
Do	2	1,200	2,400
Do	1	900	900
Lieutenants (junior grade)	3	1,500	4,500
Do	5	1,350	6,750
Do	3	900	2,700
Ensigns	3	900	2,700
Do	2	600	1,200
Do	1	500	500
Ensign (junior grade)	1	300	300
Medical directors	3	3,750	11,250
Do	12	3,300	39,600
Do	5	3,150	15,750
Do	1	2,775	2,775
Do	1	2,400	2,400
Medical inspector	1	3,300	3,300
Do	1	1,300	1,300
Surgeons	2	2,625	5,250
Do	2	2,100	4,200
Passed assistant surgeons	4	1,650	6,600
Do	1	1,100	1,100
Assistant surgeons	4	1,425	5,700
Do	1	1,275	1,275
Do	1	950	950
Do	1	850	850
Pay directors of Bureau, retired chiefs	3	3,750	11,250
Do	6	3,300	19,800
Pay inspector	1	3,300	3,300
Do	1	2,200	2,200
Paymaster	1	2,625	2,625
Do	1	2,400	2,400
Do	1	2,100	2,100
Do	1	1,400	1,400
Passed assistant paymaster	1	1,650	1,650
Do	1	1,500	1,500
Assistant paymaster	1	1,425	1,425
Chief engineers of Bureau, retired chief	1	3,750	3,750
Do	4	3,300	13,200
Do	4	2,625	10,500
Do	1	2,400	2,400
Do	1	1,200	1,200
Passed assistant engineers	10	1,650	16,500
Do	2	1,500	3,000
Do	4	1,275	5,100
Do	2	1,100	2,200
Do	1	850	850
Do	1	480	480
Assistant engineers	13	1,425	18,525
Do	7	1,275	8,925
Do	2	950	1,900
Do	1	850	850

Estimate of amount required to pay officers of the Navy, &c.—Continued.

Grade.	Num-ber.	Pay.	Amount.
Assistant engineers	2	\$600	\$1, 200
Do	1	500	500
Chaplains	8	2, 100	16, 800
Professors of mathematics	3	2, 625	7, 875
Do	2	2, 025	4, 050
Do	1	1, 800	1, 800
Naval constructor, retired chief of Bureau	1	3, 750	3, 750
Civil engineers	2	2, 625	5, 250
Do	1	2, 250	2, 250
Boatswains	9	1, 350	12, 150
Do	1	1, 050	1, 050
Do	1	975	975
Do	1	900	900
Do	1	600	600
Gunners	10	1, 350	13, 500
Carpenters	9	1, 350	12, 150
Sailmakers	7	1, 350	9, 450

Petty officers, seamen, ordinary seamen, &c.....	\$2, 400, 000
Seven hundred and fifty boys.....	100, 000

RECAPITULATION.

739 officers on sea duty.....	\$1, 532, 250
858 officers on shore duty.....	1, 652, 600
329 officers on waiting orders.....	534, 300
308 officers on retired list.....	713, 455
2, 234	4, 432, 605
Brought down	4, 432, 605
Petty officers, &c.....	2, 500, 000
Total	6, 932, 605

Statement of the appropriations for the fiscal year ending June 30, 1883, for the Department of the Navy, showing the amount appropriated under each specific head of appropriations, the amount expended under each head, and the balance remaining unexpended on the 30th of June, 1883.

	Balance on hand June 30, 1882.	Appropriations for fiscal year ending June 30, 1883.	Transferred to appropriations by appropriation warrant.	Transferred from appropriations by appropriation warrant.	Amounts applicable to the service for fiscal year ending June 30, 1883.	Amount expended fiscal year ending June 30, 1883.	Balances June 30, 1883.
Pay of the Navy.....	\$1, 629, 067 75	\$7, 236, 225 00	.....	.....	\$8, 865, 292 75	\$6, 814, 220 16	\$2, 051, 072 59
Pay, miscellaneous.....		300, 143 84	.....	.....	.....	299, 510 38	633 46
Contingent, Navy.....		103, 283 13	.....	.....	.....	87, 413 16	15, 869 97
Pay of the Marine Corps.....	185, 450 96	668, 297 00	.....	.....	853, 747 96	638, 079 73	215, 668 23
Contingent, Marine Corps.....		25, 000 00	.....	.....	.....	24, 980 50	19 50
Provisions, Marine Corps.....		68, 013 10	.....	.....	.....	65, 875 11	2, 137 99
Clothing, Marine Corps.....		79, 823 40	.....	.....	.....	79, 779 23	44 17
Fuel, Marine Corps.....		18, 496 50	.....	.....	.....	17, 357 81	1, 138 69
Military stores, Marine Corps.....		11, 286 50	.....	.....	.....	11, 260 14	26 36
Transportation and recruiting, Marine Corps.....		10, 000 00	.....	.....	.....	10, 000 00	.....
Repairs of barracks, Marine Corps.....		13, 000 00	.....	.....	.....	13, 000 00	.....
Forage for horses, Marine Corps.....		5, 400 00	.....	.....	.....	4, 000 00	1, 400 00
Pay, professors and others, Naval Academy.....		52, 506 00	.....	.....	.....	52, 200 00	306 00
Pay, watchmen and others, Naval Academy.....		24, 507 50	.....	.....	.....	24, 507 50	.....
Pay, mechanics and others, Naval Academy.....		16, 835 95	.....	.....	.....	16, 835 95	.....
Pay, steam employés, Naval Academy.....		8, 577 50	.....	.....	.....	8, 577 50	.....
Repairs Naval Academy.....		21, 000 00	.....	.....	.....	21, 000 00	.....
Heating and lighting, Naval Academy.....		17, 000 00	.....	.....	.....	17, 000 00	.....
Library, Naval Academy.....		2, 000 00	.....	.....	.....	2, 000 00	.....
Stationery, Naval Academy.....		2, 000 00	.....	.....	.....	2, 000 00	.....
Board of Visitors, Naval Academy.....		2, 600 00	.....	.....	.....	2, 600 00	.....
Chemistry, Naval Academy.....		2, 500 00	.....	.....	.....	2, 500 00	.....
Stores, Naval Academy.....		800 00	.....	.....	.....	800 00	.....
Materials, Naval Academy.....		1, 000 00	.....	.....	.....	1, 000 00	.....
Miscellaneous, Naval Academy.....		37, 600 00	.....	.....	.....	37, 600 00	.....
Navigation and navigation supplies.....		100, 244 08	.....	.....	.....	80, 427 65	19, 816 43
Lighting vessels by electricity.....		5, 000 00	.....	.....	.....	.....	5, 000 00
Copper plates (Hydrographic Office).....		15, 000 00	.....	.....	.....	.....	13, 756 06
Contingent, navigation.....		4, 000 00	.....	.....	.....	.....	519 57
Civil establishment, Navigation.....		5, 708 08	.....	.....	.....	.....	55
Hydrographic work.....		4, 698 63	.....	.....	.....	.....	1, 538 49
Naval Observatory.....		2, 674 02	.....	.....	.....	2, 109 44	564 58
Nautical Almanac.....		2, 253 42	.....	.....	.....	2, 253 42	.....
Ordnance and ordnance stores.....		150, 130 09	.....	.....	.....	139, 525 09	10, 605 00
Steel rifled breech-loading guns.....		100, 000 00	.....	.....	.....	16, 060 90	83, 939 10
Repairs, Ordnance.....		17, 500 00	.....	.....	.....	11, 856 64	5, 643 36
Contingent, Ordnance.....		3, 500 00	.....	.....	.....	2, 134 77	1, 365 23
Civil establishment, Ordnance.....		6, 513 01	.....	.....	.....	6, 512 98	03
Torpedo Corps.....		60, 000 00	.....	.....	.....	31, 875 74	28, 124 26

Equipment of vessels	750,000 00	.....	.....	740,732 33	9,267 67
Recruiting, Equipment and Recruiting	10,000 00	.....	.....	2,695 76	7,304 24
Transportation of enlisted men, Equipment and Recruiting	35,000 00	.....	.....	27,042 72	7,957 28
Contingent, Equipment and Recruiting	15,311 66	.....	.....	12,329 00	2,982 66
Civil establishment, Equipment and Recruiting	10,000 95	.....	.....	9,991 49	9 46
Naval training, Station Coasters' Harbor Island, Rhode Island	5,000 00	.....	.....	4,800 47	199 53
Maintenance Yards and Docks	220,231 94	\$39,000 00	259,231 94	251,604 80	7,627 14
Navy-yard, Brooklyn, N. Y.	150,000 00	.....	.....	99,226 33	50,773 67
Navy-yard, Washington, D. C.	27,800 00	.....	.....	19,860 00	7,940 00
Navy-yard, Norfolk, Va.	5,000 00	.....	.....	4,998 31	1 69
Navy-yard, Mare Island, Cal.	263,000 00	.....	.....	217,291 03	45,708 97
Contingent, Yards and Docks	20,000 00	.....	.....	12,117 12	7,882 88
Civil establishment, Yards and Docks	20,770 54	.....	.....	20,768 04	2 50
Repairs and preservation at navy-yards	200,000 00	\$39,000 00	161,000 00	144,646 91	16,353 09
Naval Asylum, Philadelphia, Pa.	59,813 00	.....	.....	46,530 38	13,282 62
Medical Department, Medicine and Surgery	40,000 00	.....	.....	32,024 48	7,975 52
Naval hospital fund	30,000 00	.....	.....	29,992 38	7 62
Contingent, Medicine and Surgery	15,124 44	.....	.....	11,574 36	3,550 08
Repairs, Medicine and Surgery	15,000 00	.....	.....	9,950 27	5,049 73
Museum of hygiene, Medicine and Surgery	7,500 00	.....	.....	5,271 97	2,228 03
Civil establishment, Medicine and Surgery	21,963 07	.....	.....	21,239 10	723 97
Naval laboratory, Washington, D. C.	2,000 00	.....	.....	836 25	1,163 75
Provisions, Navy	1,000,249 33	.....	.....	944,124 35	56,124 98
Contingent, Provisions and Clothing	50,000 00	.....	.....	17,706 32	32,293 68
Civil establishment, Provisions and Clothing	6,800 82	.....	.....	6,205 01	595 81
Construction and Repair	1,750,085 00	.....	.....	1,640,267 04	109,817 96
Civil establishment, Construction and Repair	21,975 75	.....	.....	19,878 17	2,097 58
Steam machinery	1,600,136 00	.....	.....	1,083,073 68	517,062 32
Contingent, Steam Engineering	1,000 00	.....	.....	1,000 00	.....
Civil establishment, Steam Engineering	10,979 73	.....	.....	10,402 01	577 72
Machine for testing iron	6,000 00	.....	.....	6,000 00	.....
Double-turreted monitors .....	.....	.....	.....	76,490 04	.....
.....	15,575,858 98	.....	.....	14,091,115 96	3,375,751 77
.....					
.....	.....	.....	59,813 00	.....	.....
.....	.....	.....	112,469 18	172,282 18	.....
.....	.....	.....	.....	13,918,833 78	.....
Net expenditure .....	.....	.....	.....	.....	.....

DEDUCT—

This sum to Naval Asylum, as that is included in appropriations, but was brought to the credit of Asylum by requisition, October 3, 1882, and is included in expenditures chargeable to Navy appropriations as refunded and deducted from amount drawn that month

And this amount, difference in general account of advances (which is not an expenditure), being June 30, 1882, \$931,137.49, and on June 30, 1883, \$818,668.31, difference

Net expenditure

No. 2.—REPORTS OF THE NAVAL ADVISORY BOARD.

NEW STEAM CRUISERS FOR THE UNITED STATES NAVY.

Advertisement and notice concerning the construction of new steel steam cruising vessels for the United States Navy.

Invitation is hereby extended to all engineers and mechanics of established reputation, and all reputable manufacturers of vessels, steam-engines, boilers or ordnance, having or controlling regular establishments, and being engaged in the business, all officers of the Navy, and especially all naval constructors, steam engineers, and ordnance officers of the Navy, having plans, models, or designs of any vessels, or of any part thereof, of the classes authorized by the naval appropriation act of August 5, 1882, to submit such plans, models, and designs to the Naval Advisory Board, directed to be organized by the Secretary of the Navy under the provisions of said act, for his advice and assistance in the designing and constructing of said vessels, in order that the same may be examined by said Board in accordance with the provisions of said act.

The vessels authorized by said act are to be two in number, to be constructed of steel of domestic manufacture, having, as near as may be, a tensile strength of not less than 60,000 pounds to the square inch, and a ductility in 8 inches of not less than 25 per centum; to be provided with full sail and full steam power, and to be of the highest attainable speed, and adapted to be armed with suitable armaments, described in said act; and one is to be of not less than 5,000 nor more than 6,000 tons displacement, and the other of not less than 4,300 nor more than 4,700 tons displacement.

Said plans, models, and designs should be submitted within the period of sixty days after August 20, 1882, and should be transmitted to the Navy Department, Washington, D. C.

The Department will, upon application, forward copies of so much of the naval appropriation act as relates to said vessels, and will answer all letters of inquiry and furnish all desired information on the subject.

WILLIAM E. CHANDLER,
Secretary of the Navy.

NAVY DEPARTMENT,
Washington, August 5, 1882.

NAVY DEPARTMENT,
Washington, November 17, 1882.

The accompanying "advertisement and notice concerning the construction of new steel steam cruising vessels for the United States Navy," inviting the presentation by any skillful person of plans, models, and designs of such vessels, was issued and published August 5, 1882, and specified sixty days after August 20, 1882, as the period within

which such plans, models, and designs should be transmitted to the Navy Department for submission to the Naval Advisory Board.

The object of this communication is to request you to submit plans, models, or designs of such vessels, or any suggestions you may desire or feel willing to make concerning their construction, and to make any explanation thereof. Notwithstanding the period fixed has expired, the Advisory Board, now in session at the Navy Department, will receive and carefully examine any such plans, models, designs, suggestions, or explanations, up to the time for final decision and action.

Your special attention is also called to the fact that the act of Congress of August 5, 1882, authorizing the construction of the new cruising vessels, contemplates that if, in such construction, any plan, model, design, or suggestion submitted by any citizen shall be deemed by the Advisory Board worthy of adoption and shall be adopted, just compensation shall be paid therefor. The amount of such compensation the Navy Department will fix and will provide for its payment.

You are also assured that by said act of Congress the construction by the Secretary of the Navy, with the advice of the Naval Advisory Board, of the two new cruising vessels is expressly and unconditionally authorized, and that, in case any contract shall be awarded for such construction, the Secretary of the Navy will execute the same, conclusively binding the United States to pay the price agreed upon, in the installments and at the times which may be stipulated for.

The conditions to be observed in the construction of the vessels, as prescribed by the act of Congress, are fully stated in the advertisement and notice, and in the extracts from the act appended thereto. The use of interior deflective steel armor is authorized, if the same upon full investigation shall seem practicable and desirable.

The Naval Advisory Board is composed of the following members:

Commodore R. W. Shufeldt, president.

Mr. Henry Steers.

Mr. Miers Coryell.

Chief Engineer Alexander Henderson.

Commander John A. Howell.

Lieut. Edward W. Very.

Naval Constructor Frank L. Fernald.

The Board will receive and reply to any communications addressed to its chairman at the Navy Department, Washington, and will, on application, furnish forms for schedules of weights, measurements, and the particulars which it is desired may accompany any plans which may be submitted for its consideration.

WILLIAM E. CHANDLER,
Secretary of the Navy.

NOTE.—No complete designs having been obtained, the Board drew up circulars embodying the essential features of the different types authorized, which were forwarded with a letter as follows:

NAVY DEPARTMENT,
Washington, March 23, 1883.

GENTLEMEN: The Department submits to your consideration the inclosed communication from the Naval Advisory Board, dated March 21, 1883, relative to the dispatch-boat, authorized by the act of Congress March 3, 1883.

The Department desires from ship-builders who would be likely to make proposals for the construction of this vessel, in case it should be built by contract, advice and suggestions concerning its design, with the view of reaching such final plans and specifications as will give the best and most effective ship of the class which can be built.

Will you oblige the Department by giving this subject your attention and furnishing such suggestions as you think may be useful or important, to be considered by the Advisory Board and the Department?

Very respectfully,

WILLIAM E. CHANDLER,
Secretary of the Navy.

CONTINENTAL IRON WORKS, *Green Point, N. Y.*
 DELAMATER IRON WORKS, *New York, N. Y.*
 Messrs. S. R. WAITE & CO., *Baltimore, Md.*
 Messrs. BIRELY, HILLMAN & STREAKER, *Kensington, Philadelphia.*
 Mr. M. C. HILL, *Mystic, Conn.*
 Messrs. WARD, STANTON & CO., *Newburg, N. Y.*
 Messrs. NEAFFIE & LEVY, *Philadelphia, Pa.*
 IRON AND STEEL SHIPBUILDING COMPANY, *Philadelphia, Pa.*
 Messrs. PUSEY, JONES & CO., *Wilmington, Del.*
 Messrs. CRAMP & SONS, *Philadelphia, Pa.*
 Messrs. JOHN ROACH & SONS, *Chester, Pa.*
 HARLAN HOLLINGSWORTH COMPANY, *Wilmington, Del.*
 THE HARTFORD ENGINEERING COMPANY, *Hartford, Conn.*
 Mr. HARRISON LORING, *Boston, Mass.*
 Messrs. FLETCHER, HARRISON & CO., *New York, N. Y.*
 WESTERN IRON-BOATBUILDING COMPANY, *Saint Louis, Mo.*
 Messrs. MALSTER & REANEY, *Baltimore, Md.*
 UNION IRON WORKS, *San Francisco, Cal.*
 RISDEN IRON WORKS, *San Francisco, Cal.*
 Messrs. H. A. RAMSEY & CO., *Baltimore, Md.*
 PROVIDENCE STEAM-ENGINE COMPANY, *Providence, R. I.*
 ATLANTIC WORKS, *East Boston, Mass.*
 QUINTARD IRON WORKS, *New York City, N. Y.*

NEW STEAM CRUISERS FOR THE UNITED STATES NAVY.

Sealed proposals are hereby invited until noon of Monday, July 2, 1883, for the construction, by contracts with the Navy Department, of one steam cruiser of about 4,500 tons displacement, two steam cruisers each of about 3,000 tons displacement, and one dispatch-boat of about 1,500 tons displacement, authorized by Congress to be built for the United States Navy.

Proposals will be received, either from American shipbuilders whose ship-yards are fully equipped for building or repairing iron and steel steamships, or from constructors of marine engines, machinery, and boilers. Satisfactory evidence that the bidders are such builders or constructors must accompany the proposals or be submitted to the Department in advance.

These vessels are to be built in accordance with all the requirements of the acts of Congress of August 5, 1882, and March 3, 1883. They are all to be constructed of steel, of domestic manufacture, having, as near as may be (according to the tests to be provided for in the contracts), a tensile strength of not less than 60,000 pounds to the square inch, and a ductility in 8 inches of not less than 25 per cent.

THE 4,500 TON CRUISER.

The dimensions of the 4,500 ton cruiser will be: length between perpendiculars, 315 feet; extreme breadth, 48 feet 2 inches; depth of hold, from top of spar-deck beams to inner bottom, 31 feet and 4 inches; mean draught, 19 feet. The vessel is to be constructed with a double bottom of 42 inches in depth, extending through the entire space occupied by the machinery, boilers, and transverse coal-bunkers, over which also will be fitted a deflective steel deck $1\frac{1}{2}$ inches thick, the outer edge extending about four feet below the load water line.

The machinery will be two complete sets of compound beam engines for twin screws, each engine with one high and one low pressure cylinder, of 45 and 72 inches diameter, with piston strokes of 52 and 54 inches, respectively. Each set will have one condenser with a condensing surface of not less than 4,800 square feet, and one independent combined air and circulating pump. There will be fourteen steel boilers of 9 feet diameter and 10 feet long, each capable of sustaining a working pressure of 100 pounds, with an aggregate grate surface of not less than 802 square feet, and a heating surface of not less than 20,000 square feet, all fitted for forced combustion, with four blowers of sufficient capacity therefor and for ventilating the ship. There will

also be required the necessary steam pumps for fire and other purposes, and two screw propellers, each 15 feet 6 inches in diameter, with 22 feet 6 inches pitch.

THE 3,000 TON CRUISERS.

The dimensions of the 3,000 ton cruisers will be: Length, 270 feet; breadth, 42 feet; depth from top of main-deck beams to top of flat keel plate, 26 feet and $1\frac{1}{2}$ inches; mean draught, 17 feet. The vessels are to be constructed with double bottoms 40 inches deep amidships, extending through the entire space occupied by the boilers, engines, and transverse coal bunkers, over which also will be fitted a protective steel deck $1\frac{1}{2}$ inches in thickness.

The machinery will be a back-acting compound engine, with one high and two low pressure cylinders, of 54 and 74 inches diameter, respectively, with a piston stroke of 42 inches; two condensers with a condensing surface of not less than 5,500 square feet; and two independent combined air and circulating pumps. There will be eight cylindrical steel boilers of 11 feet 8 inches diameter and 9 feet 9 inches long, each capable of sustaining a working pressure of 90 pounds, with an aggregate grate surface of not less than 400 square feet, and a heating surface of not less than 10,000 square feet, all fitted for forced combustion, with blowers of sufficient capacity therefor and for ventilating the ship. There will also be required the necessary steam pumps for fire and other purposes, and a screw propeller 17 feet in diameter, with 20 feet pitch.

THE DISPATCH BOAT.

The dimensions of the dispatch boat will be: Length, 240 feet; breadth, 32 feet; mean draught, excluding keel, $13\frac{1}{2}$ feet; and the vessel will have a displacement of about 1,500 tons.

The machinery will be one compound engine with two vertical overhead cylinders of 45 and 78 inches diameter, respectively, and a piston stroke of 48 inches, with one surface condenser, having a condensing surface of not less than 3,400 square feet; an air pump worked by a beam connected with the crosshead of the low-pressure cylinder, and an independent circulating pump. There will be two steel boilers of 11 feet diameter and 18 feet 3 inches long, each with two furnaces at each end with separate back connections, and two steel boilers of 11 feet diameter and 9 feet 6 inches long, each with two furnaces, all the boilers to be capable of sustaining a working pressure of 90 pounds, and to have an aggregate grate surface of not less than 275 square feet, with a heating surface of about 6,600 square feet, all fitted for forced combustion, with three blowers of sufficient capacity therefor and for ventilating the ship. There will also be required the necessary steam pumps for fire and other purposes, and a screw propeller of 14 feet diameter, and a length and pitch for a speed of 15 knots.

No offer for more than one vessel should be included in the same proposal. Each contract awarded will be for the hull and machinery of one vessel with such equipments as may be specified.

Each proposal must be preceded or accompanied by a cash deposit, or satisfactory certified check payable to the order of the Secretary of the Navy, which shall become the property of the United States in case the successful bidder shall fail to enter into a contract, with sureties as required, within twenty days after the acceptance of his proposal. The amount of such deposit or check shall be \$30,000 on the 4,500-ton cruiser, \$20,000 on each of the 3,000-ton cruisers, and \$10,000 on the dispatch boat. All deposits and checks of bidders whose proposals shall not be accepted within five days after the 2d day of July, 1883, will, at the end of that period, be returned to them; and those of each successful bidder will be returned to him when his contract has been duly entered into.

Every successful bidder will be required, within twenty days after the acceptance of his proposal, to enter into formal contract for the performance of his work, and to give a bond therefor, with sufficient sureties, and with a penal sum of \$500,000 if to build the 4,500-ton cruiser, \$300,000 if to build either of the 3,000-ton cruisers, and \$150,000 if to build the dispatch boat.

The three cruisers must be completed within eighteen months and the dispatch boat within twelve months from the execution of the respective contracts. Payments to each contractor will be made in ten equal installments as the work progresses, upon bills duly certified, from which 10 per cent. will be reserved, to be paid on the full and final completion of the contract.

The designs and specifications of the vessels may be seen at the Navy Department in Washington, and all information essential to bidders will be given there. Proposals must be made according to forms which will be furnished by the Department.

WILLIAM E. CHANDLER,
Secretary of the Navy.

NAVY DEPARTMENT,
Washington, April 28, 1883.

Tabular statement of proposals for the construction of the steam steel cruisers Chicago, Boston, and Atlanta, and the dispatch boat Dolphin.

CHICAGO.

No. 1. The Harlan & Hollingsworth Company, iron-steamship builders, Wilmington, Del.....	\$1,120,000
No. 2. The William Cramp & Son's Ship and Engine Building Company, Philadelphia, Pa.....	1,080,000
No. 3. C. H. Delamater, Delamater Iron Works, New York City, N. Y. ...	1,163,000
*No. 4. John Roach, Morgan Iron Works, New York City, N. Y.....	889,000

ATLANTA.

No. 5. The Harlan & Hollingsworth Company, iron-steamship builders, Wilmington, Del	775,000
No. 6. The William Cramp & Son's Ship and Engine Building Company, Philadelphia, Pa.....	650,000
*No. 7. John Roach, Morgan Iron Works, New York City, N. Y.....	617,000
No. 8. H. F. Palmer, jr., & Co., Quintard Iron Works, New York City, N. Y.....	763,400

BOSTON.

No. 9. The Harlan & Hollingsworth Company, iron steamship builders, Wilmington, Del.....	777,000
No. 10. The William Cramp & Son's Ship and Engine Building Company, Philadelphia, Pa.....	650,000
*No. 11. John Roach, Morgan Iron Works, New York City, N. Y.....	619,000
No. 12. Harrison Loring, Boston, Mass.....	748,000

DOLPHIN.

No. 13. The William Cramp & Son's Ship and Engine Building Company, Philadelphia, Pa.....	375,000
*No. 14. John Roach, Morgan Iron Works, New York City, N. Y.....	315,000
No. 15. Theodore Allen and Anthony H. Blaisdell, constituting the firm of Allen & Blaisdell, Saint Louis, Mo.....	380,000
No. 16. Henry Ashton Ramsay, of the firm of H. A. Ramsay & Co., Baltimore, Md.....	420,000

Contract for the construction of a steam cruiser of about 4,500 tons displacement.

CHICAGO.

Contract, of two parts, made and concluded this 26th day of July, A. D. 1883, between John Roach, of the city, county, and State of New York, as principal, and Geo. W. Quintard, of the city, county, and State of New York, and William Rowland, of the city of New Brunswick, State of New Jersey, as sureties, parties of the first part, and the United States, represented by William E. Chandler, Secretary of the Navy, party of the second part.

Whereas the act making appropriations for the naval service for the year ending June 30, 1884, approved March 3, 1883, made an appropriation for the construction of a steel cruiser of not less than 4,300 tons displacement, then specially authorized by

* Accepted.

law; two steel cruisers of not more than 3,000 nor less than 2,500 tons displacement each, and one dispatch boat; and authorized the Secretary of the Navy to construct said vessels;

And whereas, after due advertisement, the proposal of the said principal party of the first part for the construction of the hull and machinery of one of said vessels, to wit, a steel cruiser of about 4,500 tons displacement, has been duly accepted by the Secretary of the Navy;

And whereas the drawings and specifications required by the act of August 5, 1882, have been duly provided, adopted, and approved in accordance with the provisions of said act relating thereto;

Now, therefore, this contract witnesseth that, in consideration of the premises and for and in consideration of the payments hereinafter provided for, the parties of the first part, for themselves, their heirs and assigns, personal and legal representatives, do hereby covenant and agree to and with the United States as follows, that is to say:

First. The said parties of the first part will, at their own risk and expense, construct, in conformity with the aforesaid plans and specifications hereto annexed, and in accordance with the provisions of the acts of Congress approved August 5, 1882, and March 3, 1883, respectively, before mentioned and relating thereto, one steel cruiser of about 4,500 tons displacement, with fittings as specified, of the following principal dimensions:

Length between perpendiculars.....	315 feet.
Extreme breadth	48 feet 2 inches.
Depth in hold from top of spar-deck beams to inner bottom	31 feet 3 inches.

and provided and fitted with machinery, engines, and boilers complete in all their parts, appurtenances, and spare parts, and in all respects as described in the specifications, and deliver the same at the port of New York, N. Y., or Norfolk, Va., to such persons as the Secretary of the Navy may direct to receive the same, at either of said ports.

Second. The construction of the hull and machinery, and the fittings of the vessel, shall conform in all respects to and with the plans and specifications hereto annexed, which plans and specifications shall be deemed and taken as forming part of this contract with the like operation and effect as if the same were incorporated therein. No omission, in the plans or specifications, of any detail, object, or provision necessary to carry this contract into full and complete effect, in accordance with the object and intent of the acts of Congress above mentioned, shall operate to the disadvantage of the United States, but the same shall be satisfactorily supplied, performed, and observed by the parties of the first part, and all claims for extra compensation by reason of, or for or on account of, such extra performance, are hereby and in consideration of the premises expressly waived; and it is hereby further provided, and this contract is upon the express condition, that the drawings and specifications provided, adopted and approved as herein before mentioned, shall not be changed in any respect, when the cost of such change shall, in the construction, exceed five hundred dollars, except upon the approval of the Naval Advisory Board, or a majority thereof, in writing, and the written order of the Secretary of the Navy; and if changes are thus made, the actual cost thereof and the damage caused thereby, and the amount of the increased or diminished compensation which the contractors shall be entitled to receive, if any, in consequence of such change or changes, shall be ascertained, estimated and determined by said Board, or a majority thereof, which determination shall be binding upon the parties of the first part, who hereby expressly covenant and agree to accept and abide by such determination.

Third. The materials and workmanship used and applied in the construction of the hull and machinery and fittings of said vessel, in details and finish, shall be first-class and of the very best quality, and shall, from the beginning to the end of the work, be subject to the inspection of the Naval Advisory Board, and said Board shall have general supervision of the work under the direction of the Secretary of the Navy; it being hereby expressly understood, covenanted, and agreed that the said Secretary may appoint suitable inspectors, acting under the direction of the Naval Advisory Board, to whom the contractors agree to furnish such samples, and such information as to the quality thereof and the manner of using the same, as may be required, and also any assistance they may require in determining the weight and quality of steel and other metals, and of wood and other materials, either used or intended for use in the construction of said vessel or machinery; and the inspectors may, with the approval of the Naval Advisory Board, peremptorily reject any unfit material or forbid the use thereof. The Naval Advisory Board and the inspectors shall, at all times during the progress of the work, have full access thereto, and the contractors shall furnish them with full facilities for the inspection and superintendence of the same.

Fourth. The steel to be used in the construction of the hull and boilers of the vessel to be built under this contract shall conform to the "tests of steel for cruisers," prescribed by the Naval Advisory Board, and approved by the Secretary of the Navy June 18, 1883, the same being annexed to and forming a part of this contract.

Fifth. It is hereby agreed by the contractors that such plans as it may be necessary to prepare during the progress of the work shall be at their expense, and shall be submitted to the Naval Advisory Board for approval before the material is ordered or the work commenced.

Sixth. The parties of the first part, in consideration of the premises, hereby covenant and agree to hold and save the United States harmless from and against all and every demand or demands of any nature or kind for or on account of the adoption of any plan, model, design, or suggestion, or for or on account of the use of any patented invention, article, or appliance which has been or may be adopted or used in or about the construction of the hull, machinery, and fittings of said vessel, or any part thereof, under this contract, and to protect and discharge the Government from all liability on account thereof by proper releases from patentees or otherwise, and to the satisfaction of the Secretary of the Navy, before final payment under this contract shall be made.

Seventh. The hull, machinery, and fittings of the vessel to be constructed under this contract, shall be completed and ready for inspection for the purpose of delivery to the United States on or before the expiration of eighteen months from the date of this contract; but the lien of the United States upon said hull, machinery, and fittings, respectively and collectively, for all moneys advanced on account thereof, shall commence with the first payment, and shall thereupon attach to so much of the work and materials as shall then have been performed and furnished, and shall in like manner attach from time to time as the work progresses and as further payments are made, and shall continue until the same shall have been properly discharged.

Eighth. The hull, machinery, and fittings, embraced by this contract, and all materials and appliances provided for and used or to be used in the construction thereof, shall be kept duly insured, which insurance shall be renewed and increased from time to time, by and at the expense of the parties of the first part, in an amount sufficient to cover all advance payments made under this contract, the loss, if any, to be stated in the policies as payable to the United States, and the insurance shall be effected in such manner and in such companies as shall be approved by the Secretary of the Navy.

Ninth. The parties of the first part hereby further agree that the vessel constructed under this contract shall be sufficiently strong to carry the armament, equipment, coal, stores, and machinery, prescribed by the Naval Advisory Board and indicated in the annexed drawings and specifications, and that when the vessel is completed and ready for delivery, as required by the specifications, the same shall be subjected to a trial trip, under conditions prescribed by the Naval Advisory Board and approved by the Secretary of the Navy, to test the machinery, engines, boilers, and appurtenances, and shall be accepted only on fulfillment of, and subject to, the conditions and agreements hereinafter set forth:

(1.) That the working of said machinery in all its parts shall be to the satisfaction of the Naval Advisory Board.

(2.) That the collective indicated horse-power developed by said engines under the prescribed conditions shall be five thousand (5,000), and maintained successfully for six (6) consecutive hours; provided that, in case of the failure of the development of this power, the vessel shall be accepted if it can be shown to the satisfaction of the Naval Advisory Board and the Secretary of the Navy that this failure was due neither to defective workmanship nor materials.

(3.) It is further agreed and covenanted by the parties of the first part that, in event of the engines or work pertaining thereto not being duly completed, or if, at any time during four months after the said engines shall have been accepted, they shall be found to be defective in their original construction either with respect to workmanship or materials, or in event of the failure, breaking down, or deterioration, other than that due to fair wear and tear, of any part or parts of the engines or appurtenances, the same shall be repaired, to the entire satisfaction of the Secretary of the Navy, at the expense of the contractor.

(4.) The parties of the first part hereby further covenant and agree that the total weight of the said engines and machinery, boilers, appurtenances, and spare parts, complete as specified, and including water in the surface condensers and boilers, shall not exceed nine hundred and thirty-seven (937) tons, this weight to be determined from the certified records of the actual weight of the parts of the machinery as they are sent on board the vessel to be connected up. If this weight be exceeded by five per cent. the contractor shall pay a penalty of \$5,000 (five thousand dollars), and also a penalty of \$500 (five hundred dollars) per ton for each ton of excess weight, over that stipulated, above the five per cent. excess, as ascertained and liquidated damages due the United States, to be deducted from instalments still due.

Tenth. If, at and upon the trial trip before mentioned, the hull and fittings are found by the Naval Advisory Board to be strong and well built and in strict conformity with the contract, drawings, and specifications, the same shall be accepted, and the final payments made, including all reservations, subject, however, to a reserve of twenty thousand (\$20,000) dollars from the reservations hereinafter set forth. This sum shall be held until the vessel has been finally tried when fully equipped, armed, and in all

respects complete and ready for sea, under conditions prescribed by the Naval Advisory Board and approved by the Secretary of the Navy, provided that such trial shall take place within four months of the preliminary acceptance above mentioned.

If the vessel be not in readiness for such final trial within the time specified, through no fault or delay on the part of the contractors, and no defects in the hull due to either defective workmanship or materials shall have appeared, then the vessel shall be finally accepted and the reserve aforesaid paid.

If upon such final trial, or within four months from the date of the preliminary acceptance, said final trial not having taken place, any weakness or defect in the hull due to either bad workmanship or materials shall appear, the same must be repaired to the satisfaction of the Naval Advisory Board and the Secretary of the Navy, and at the expense of the contractors.

Eleventh. It is further mutually understood, covenanted, and agreed, that in case of the failure or omission of the contractors, at any stage of the work prior to final completion, from any cause other than the order of the Secretary of the Navy, to go forward with the work and make satisfactory progress toward its completion within the prescribed time, it shall be optional with the said Secretary to declare this contract forfeited. The parties of the first part shall thereupon, and on notice thereof to them, or any one of them, in writing, be, and they do hereby, in consideration of the premises, jointly and severally, for themselves and their heirs and assigns, personal and legal representatives, acknowledge themselves to be, justly indebted to the United States, as for liquidated and ascertained damages, in a sum equal to the aggregate amount of all advance payments theretofore made to them for or on account of the work to be done under this contract, and do further jointly and severally, as aforesaid, covenant and agree to refund the same on demand, or within sixty days thereafter, and that the United States shall and may hold as collateral security for such refund the vessel, machinery, materials, and fittings, or so much thereof as shall then have been constructed or furnished or as shall be on hand for the purposes of construction. The Secretary of the Navy shall thereupon cause to be taken and filed a full and complete statement and inventory of all work done or commenced in, upon, or about the hull, machinery, and fittings of said vessel, and of all materials on hand applicable thereto, and shall cause the same to be duly valued by a Board consisting of not less than five persons qualified by knowledge and experience for the discharge of their duties, to be appointed by the Secretary of the Navy, which Board shall proceed without unnecessary delay to examine such work and materials and ascertain and declare the fair market value thereof, including a reasonable and customary margin of profit upon so much of the work as shall have been, at the time such forfeiture is declared, satisfactorily performed; and upon such examination the parties of the first part may attend in person and by counsel and submit such evidence as the Board may deem proper.

Twelfth. Upon the receipt of the report and finding of said Board, and upon his approval thereof, the Secretary of the Navy may, in his discretion, proceed to complete the vessel, machinery, and fittings, in accordance with the contract, plans, and specifications, using for that purposes all suitable materials on hand and included in the inventory aforesaid; and the title to said vessel, machinery, and fittings, or so much thereof as shall have been completed, and to all such materials, shall forthwith vest in the United States; and the parties of the first part do hereby, for themselves, their heirs, and assigns, personal and legal representatives, jointly and severally covenant and agree to and with the United States that, on receiving notice of the intention of the Secretary of the Navy to proceed to the completion of the work, they will surrender the same and all materials on hand, together with the use of the yard or "plant," and all machinery, tools, and appliances appertaining thereto and theretofore used or necessarily to be used in and about the completion of the work.

Thirteenth. In case the Secretary of the Navy shall proceed, under the foregoing clause, to complete the work, such procedure shall be without unnecessary delay, and shall be at the risk and expense of the parties of the first part, who shall be chargeable with any increase in the cost of materials or labor incurred by reason of the failure of the contractors to perform the contract. Upon the final settlement of the liability of the parties of the first part an account shall be stated substantially as follows:

The contractors shall be charged—

1. With all advance payments.
2. With the extra cost, if any, of materials and labor, and all other extra expenses, if any, over and above the contract price, incurred in the completion of the work.

They shall then be credited with the value of the work done up to the time of suspension, and of the materials on hand, as ascertained by the Board and approved by the Secretary of the Navy under the provisions of the eleventh clause of this contract, and with such advance payments, if any, as may have been refunded. If a balance shall thereupon appear in favor of the contractors, the same shall be paid to and accepted by them in full discharge of all claims under this contract; but if a balance shall appear in favor of the United States, the parties of the first part hereby covenant and agree as aforesaid to pay and discharge the same on demand.

Fourteenth. It is mutually understood, covenanted, and agreed, by and between the

respective parties, that it shall not, under any circumstances, be obligatory upon the party of the second part to accept the vessel or any part thereof to be constructed under this contract unless the same shall have been completed in strict conformity with this contract, under the supervision of the Naval Advisory Board, and in accordance with the provisions of the act of August 5, 1882, as modified by the act of March 3, 1883, hereinbefore referred to, and that this qualification shall be deemed and taken as applicable and applying to each and every clause, covenant, and condition, express or implied, in this contract contained.

Fifteenth. It is hereby mutually and expressly covenanted and agreed, and this contract is upon the express condition, that no member of or delegate to Congress, nor any officer of the United States, naval, military, or civil, is, or shall be, admitted to any share or part of this contract, or to any benefit to arise therefrom.

Sixteenth. The United States, in consideration of the premises, do hereby contract, promise, and engage to and with the parties of the first part as follows:

1. The contract price to be paid for the vessel, machinery, and fittings, to be constructed and furnished in accordance with this contract, shall be (\$889,000) eight hundred and eighty-nine thousand dollars.

2. Payments shall be made by the United States in ten equal instalments, as the work progresses, with a reservation of ten per cent. from each instalment.

3. No payment shall be made except upon bills, in triplicate, certified by the Inspectors and Naval Advisory Board in such manner as shall be directed by the Secretary of the Navy, whose final approval of all bills thus certified shall be necessary before payment thereof.

4. All warrants for payments under this contract shall be made payable to the contractors or their order.

5. The last payment shall not be made until this contract shall have been fully performed by or on the part of the parties of the first part, and the vessel, machinery, and fittings shall have been accepted by the party of the second part, as in the tenth clause of this contract hereinbefore recited.

6. When all the conditions, covenants, and provisions of this contract shall have been performed and fulfilled by and on the part of the contractors they shall be entitled, within ten days after the filing and acceptance of their claim, to receive the aggregate amount of the reservations from the respective payments made to them during the progress of the work, on the execution of a final release to the United States, in such form as shall be approved by the Secretary of the Navy, of all claims of any kind or description under or by virtue of this contract.

Seventeenth. If any doubts or disputes arise as to the meaning of anything in the drawings or specifications, or if any discrepancy appear between the drawings and specifications and this contract, the matter shall be at once referred to the Secretary of the Navy for determination, and the parties of the first part hereby bind themselves and their heirs and assigns, personal and legal representatives, to abide by his decision in the premises.

In witness whereof the respective parties have hereunto set their hands and seals the day and year first above written.

JOHN ROACH. [L. S.]
GEO. W. QUINTARD. [L. S.]
WM. ROWLAND. [L. S.]

Signed and sealed in presence of—(the word “seven” interlined and the figure (7) inserted before execution)—

JAMES MOONEY.
GEO. E. WEED.

THE UNITED STATES, [L. S.]
By WM. E. CHANDLER, [L. S.]
Secretary of the Navy.

To signature of W. E. Chandler:
JESSE E. DOW,
Act'g Chief Clerk, Navy Department.

TESTS OF STEEL FOR CRUISERS.

Instructions to inspectors.

NAVY DEPARTMENT, NAVAL ADVISORY BOARD,
June 18, 1883.

The following rules are prescribed in order to insure the fulfillment of the clause of the act of Congress of August 5, 1882: “Such vessels * * * to be constructed of steel, of domestic manufacture, having, as near as may be, a tensile strength of not

less than sixty thousand pounds to the square inch, and a ductility in eight inches of not less than twenty-five per centum:"

I. All ship-plates, beams, angles, rivets, bolts, boiler-plates, and stays, to be inspected and tested at the place of manufacture by a naval inspector of material, and to be passed by him, subject to restrictions hereinafter mentioned, before acceptance by the ship-builders, whether Government or private, for incorporation into said vessels.

II. Every plate, beam, and angle, supplied for these vessels, to be clearly and indelibly stamped in two places, and with two separate brands: 1st, with that of the maker, which shall distinguish the name of the manufactory or company; 2d, with the regulation brand of the naval inspector of material. The latter not to be stamped upon any of the above-mentioned material until it shall have passed the required inspection and tests, have been accepted by the inspector, and have been stamped with the maker's brand.

In case of small articles passed in bulk, the above-mentioned brands shall be applied to the boxing or packing material of the objects.

No steel material to be received at the building yards for incorporation into the vessels except it bear, either upon its surface or that of its packing, both of these brands as evidence that it has passed the necessary Government inspection.

SHIP-PLATES.

III. In every lot of twenty plates test pieces to be cut from two plates taken at random; two test pieces being cut from each plate, one in the direction of the rolling, and one at right angles to it, shaped according to the annexed sketch. These test pieces shall in no case be annealed.

The test pieces to be submitted to a direct tensile stress until they break, and in a machine of approved character.

The initial stress to be as near the elastic limit as possible; which limit is to be carefully determined by the inspector in a special series of tests. The first load to be kept in continuous action for five minutes. Additional loads to be then added at intervals of time as nearly as possible equal, and separated by half a minute; the loads to produce a strain of 5,000 pounds per square inch of original section of the test piece until the stress is about 50,000 pounds per square inch of original section, when the additional loads should be in increments not exceeding 1,000 pounds.

An observation to be made of the corresponding elongation measured upon the original length of eight inches.

The final elongation to be that obtained at rupture. The loads applied shall never be calculated from the indications of the pressure gauge if a hydraulic press be used.

CONDITIONS OF ACCEPTANCE.

In order to be accepted the average of the four test pieces must show an ultimate tensile strength of at least 60,000 pounds per square inch of original section, and a final elongation in eight inches of not less than 23 per cent.

Lots of material which show a strength greater than 60,000 pounds per square inch will be accepted, provided the ductility remains at least 23 per cent.

CASES OF FAILURE.

If the average of these four tests pieces, numbered 1, 2, 3, 4 (called Test I), fall below either of the required limits, the plates from which pieces 1, 2, 3, 4 were cut shall be rejected, and Test II made, consisting of pieces 5 and 6, cut from a third plate; if the mean of the results of these two fall below either of the above limits the entire lot shall be rejected. If it be successful, Test III or the mean of pieces 7 and 8 cut from a fourth plate shall decide.

If in any of Tests I, II, III, any single piece shows a tensile strength less than 58,000 pounds or a final elongation less than 21 per cent., the plate from which it was cut shall be rejected and that test considered to have failed, regardless of its average.

QUENCHING TEST.

IV. A test piece shall be cut from *each* plate, angle, or beam, and after heating to a cherry red, plunged in water at a temperature of 82° Fahrenheit. Thus prepared it must be possible to bend the pieces under a press or hammer so that they shall be doubled round a curve of which the diameter is not more than one and a half times the thickness of the plates tested without presenting any trace of cracking.

These test pieces must not have their sheared sides rounded off, the only treatment permitted being taking off the sharpness of the edges with a fine file.

ANGLES, BEAMS, BULB BARS, T-BARS, ETC.

V. In every lot of twenty angles or beams, &c., test pieces to be cut from the webs of two taken at random, one from each. These pieces to be fashioned in the same way, and to be subjected to the same tests, both tensile and quenching, and to fulfill the same requirements for acceptance as already prescribed for ship-plates.

Angle bars are to be subjected to the following additional tests: A piece cut from one bar in twenty to be opened out flat while cold under the hammer; a piece cut from another bar in the same lot shall be closed until the two sides touch, while cold; a piece from a third bar of the lot to be bent cold into a ring, so that one of the sides of the angle bar shall be kept flat and the other side forming a cylinder, of which the internal diameter shall be equal to three and a half times the breadth of the sides which remain flat. The angle bars submitted to these tests must show neither cracks, clifts, nor flaws.

Single T-bars to be submitted to the following tests: A piece to be cut from the end of a bar taken at random from each lot of twenty, and to be bent cold into a half ring, so that, the web remaining in its own plane, the cross flanges shall form a half cylinder, of which the internal diameter shall equal four times the height of the web of the T-bar.

At the end of another bar of the same lot the web to be split down its middle for a length equal to three times its total depth, and a hole drilled at the end of the slit to prevent it spreading; the piece thus split to be opened out in its own plane, so as to make an angle of 45° with the rest, care to be taken that the part opened shall be kept straight, except that it must be joined to the rest of the bar by a bend of small radius.

Bulb-bars are to be subjected to the same tests as those prescribed for T-bars, except that in bending one or more heats may be used.

All bars submitted to these tests must show neither cracks, clifts, nor flaws.

RIVETS.

VI. One bar from every lot of twenty of the bars from which rivets are made shall be subject to the same tensile test as that required for the plate tests. All bars not fulfilling the requirements of tensile strength and elongation required for plates to be rejected.

From every lot of 500 pounds four rivets are to be taken at random and submitted to the following tests, one rivet to be used for each test: 1st. A rivet to be flattened out cold under the hammer to a thickness of one-half its diameter without showing cracks or flaws. 2d. A rivet to be flattened out hot under the hammer to a thickness one-third its diameter without showing cracks or flaws. 3d. A rivet to be bent cold into the form of a hook with parallel sides without showing cracks or flaws. 4th. A rivet to be tested by shearing by riveting it up to two pieces of steel which are to be submitted to a tensile strain, the rivet not to shear under a stress of less than 50,000 pounds per square inch.

BOILER PLATES.

VII. *Each* boiler plate must be subjected to the same tests and in the manner prescribed for ship plates. The ductility in 8 inches must not be less than 25 per cent., and the ultimate tensile strength must not be less than 57,000 pounds and not more than 63,000 pounds, and the average at least 60,000 pounds.

The acceptance of material under these tests will not relieve the contractor from the necessity of making good any material which fails in working or may be rejected by the inspector.

R. W. SHUFELDT,
Rear-Admiral, U. S. Navy, President Naval Advisory Board.

Approved.

WILLIAM E. CHANDLER,
Secretary of the Navy.

Bond accompanying the contract for the construction of a steam cruiser of about 4,500 tons displacement.

CHICAGO.

Know all men by these presents, that we, John Roach, of the county of New York, in the State of New York, as principal, Geo. W. Quintard, of the county of New York, in the State of New York, and William Rowland, of the county of Somerset, in the State of New Jersey, as sureties, are held and firmly bound unto the United States of America in the full and just sum of five hundred thousand dollars, lawful money of

the United States, to be paid to the said United States; for which payment, well and truly to be made, we bind ourselves and our heirs, executors, and administrators, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 26th day of July, anno Domini one thousand eight hundred and eighty-three.

The condition of the above obligation is such, that if the above bound John Roach, shall well and truly perform the stipulations of the contract hereunto annexed, entered into with the Secretary of the Navy, for and in behalf of the United States, agreeing to construct a steam cruiser of about 4,500 tons displacement, conforming in all respects to said contract, and plans and specifications attached thereto and forming a part thereof, then the above obligation to be void and of no effect; otherwise, to be and remain in full force and virtue.

JOHN ROACH, [SEAL.]
GEO W. QUINTARD, [SEAL.]
WM ROWLAND. [SEAL.]

Signed, sealed, and delivered in the presence of—

JAS. MOONEY,
GEO. E. WEED.

Bondsmen's oaths.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public in and for the county and State above named, personally appeared Geo. W. Quintard, by occupation a steam-engine builder, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of two hundred and fifty thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property lying in the county of New York and State of New York.

GEO. W. QUINTARD.

Sworn and subscribed before me this 26th day of July, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County New York.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public, in and for the county and State aboved named, personally appeared William Rowland, by occupation a steam-ship joiner, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of two hundred and fifty thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property lying in the county of Somerset and State of New Jersey, and personal property in the county of New York, State of New York.

WM. ROWLAND.

Sworn and subscribed before me this 26th day of July, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County New York.

NAVY PAY OFFICE, No. 27, STATE STREET,
New York, August 13, 1883.

I hereby certify that George W. Quintard and William Rowland, the persons named in and who executed the foregoing bond, are to me well known; that they are residents of New York City and New Brunswick, N. J., and are, in my opinion, good and sufficient sureties for the purposes mentioned in said bond.

THOMAS T. CASWELL, [L. S.]
Pay Inspector, United States Navy.

Contract for the construction of a steam cruiser of about 3,000 tons displacement.

BOSTON.

Contract, of two parts, made and concluded this 23d day of July, A. D. 1883, between John Roach, of the city, county, and State of New York, as principal, and Levi Kerr, of the city of Cleveland, State of Ohio, and Thomas F. Rowland, of the city, county, and State of New York, as sureties, parties of the first part, and the United States, represented by William E. Chandler, Secretary of the Navy, party of the second part.

Whereas the act making appropriations for the naval service for the year ending June 30, 1884, approved March 3, 1883, made an appropriation for the construction of

a steel cruiser of not less than 4,300 tons displacement, then specially authorized by law; two steel cruisers of not more than 3,000 nor less than 2,500 tons displacement each, and one dispatch boat; and authorized the Secretary of the Navy to construct said vessels:

And whereas, after due advertisement, the proposal of the said principal party of the first part for the construction of the hull and machinery of one of said vessels, to wit, a steel cruiser of about 3,000 tons displacement, has been duly accepted by the Secretary of the Navy;

And whereas the drawings and specifications required by the act of August 5, 1882, have been duly provided, adopted, and approved in accordance with the provisions of said act relating thereto:

Now, therefore, this contract witnesseth that, in consideration of the premises and for and in consideration of the payments hereinafter provided for, the parties of the first part, for themselves, their heirs and assigns, personal and legal representatives, do hereby covenant and agree to and with the United States as follows, that is to say:

First. The said parties of the first part will, at their own risk and expense, construct, in conformity with the aforesaid plans and specifications hereto annexed, and in accordance with the provisions of the acts of Congress approved August 5, 1882, and March 3, 1883, respectively, before mentioned and relating thereto, one steel cruiser of about 3,000 tons displacement, with fittings as specified, of the following principal dimensions:

Length between perpendiculars.....	270 feet.
Extreme breadth.....	42 feet.
Depth in hold from top of main-deck beams to inner bottom	22 feet 10 inches,

and provided and fitted with machinery, engines, and boilers, complete in all their parts, appurtenances, and spare parts, and in all respects as described in the specifications, and deliver the same at the port of New York, N. Y., or Norfolk, Va., to such persons as the Secretary of the Navy may direct to receive the same, at either of said ports.

Second. The construction of the hull and machinery, and the fittings of the vessel, shall conform in all respects to and with the plans and specifications hereto annexed, which plans and specifications shall be deemed and taken as forming part of this contract with the like operation and effect as if the same were incorporated therein. No omission, in the plans or specifications, of any detail, object, or provision necessary to carry this contract into full and complete effect, in accordance with the object and intent of the acts of Congress above mentioned, shall operate to the disadvantage of the United States, but the same shall be satisfactorily supplied, performed, and observed by the parties of the first part, and all claims for extra compensation by reason of, or for or on account of, such extra performance, are hereby and in consideration of the premises expressly waived; and it is hereby further provided, and this contract is upon the express condition, that the drawings and specifications provided, adopted, and approved as herein before mentioned, shall not be changed in any respect, when the cost of such change shall, in the construction, exceed five hundred dollars, except upon the approval of the Naval Advisory Board, or a majority thereof, in writing, and the written order of the Secretary of the Navy; and if changes are thus made, the actual cost thereof and the damage caused thereby, and the amount of the increased or diminished compensation which the contractors shall be entitled to receive, if any, in consequence of such change or changes, shall be ascertained, estimated, and determined by said Board, or a majority thereof, which determination shall be binding upon the parties of the first part, who hereby expressly covenant and agree to accept and abide by such determination.

Third. The materials and workmanship used and applied in the construction of the hull and machinery and fittings of said vessel, in details and finish, shall be first-class and of the very best quality, and shall, from the beginning to the end of the work, be subject to the inspection of the Naval Advisory Board, and said Board shall have general supervision of the work under the direction of the Secretary of the Navy; it being hereby expressly understood, covenanted, and agreed that the said Secretary may appoint suitable inspectors, acting under the direction of the Naval Advisory Board, to whom the contractors agree to furnish such samples, and such information as to the quality thereof and the manner of using the same, as may be required, and also any assistance they may require in determining the weight and quality of steel and other metals, and of wood and other materials, either used or intended for use in the construction of said vessel or machinery; and the inspectors may, with the approval of the Naval Advisory Board, peremptorily reject any unfit material or forbid the use thereof. The Naval Advisory Board and the inspectors shall, at all times during the progress of the work, have full access thereto, and the contractors shall furnish them with full facilities for the inspection and superintendence of the same.

Fourth. The steel to be used in the construction of the hull and boilers of the vessel to be built under this contract shall conform to the "tests of steel for cruisers"

prescribed by the Naval Advisory Board, and approved by the Secretary of the Navy June 18, 1883, the same being annexed to and forming a part of this contract.

Fifth. It is hereby agreed by the contractors that such plans as it may be necessary to prepare during the progress of the work shall be at their expense, and shall be submitted to the Naval Advisory Board for approval before the material is ordered or the work commenced.

Sixth. The parties of the first part, in consideration of the premises, hereby covenant and agree to hold and save the United States harmless from and against all and every demand or demands of any nature or kind for or on account of the adoption of any plan, model, design, or suggestion, or for or on account of the use of any patented invention, article, or appliance which has been or may be adopted or used in or about the construction of the hull, machinery, and fittings of said vessel, or any part thereof, under this contract, and to protect and discharge the Government from all liability on account thereof by proper releases from patentees or otherwise, and to the satisfaction of the Secretary of the Navy, before final payment under this contract shall be made.

Seventh. The hull, machinery, and fittings of the vessel to be constructed under this contract, shall be completed and ready for inspection for the purpose of delivery to the United States on or before the expiration of eighteen months from the date of this contract; but the lien of the United States upon said hull, machinery, and fittings, respectively and collectively, for all moneys advanced on account thereof, shall commence with the first payment, and shall thereupon attach to so much of the work and materials as shall then have been performed and furnished, and shall in like manner attach from time to time as the work progresses and as further payments are made, and shall continue until the same shall have been properly discharged.

Eighth. The hull, machinery, and fittings, embraced by this contract, and all materials and appliances provided for and used or to be used in the construction thereof, shall be kept duly insured, which insurance shall be renewed and increased from time to time, by and at the expense of the parties of the first part, in an amount sufficient to cover all advance payments made under this contract, the loss, if any, to be stated in the policies as payable to the United States, and the insurance shall be effected in such manner and in such companies as shall be approved by the Secretary of the Navy.

Ninth. The parties of the first part hereby further agree that the vessel constructed under this contract shall be sufficiently strong to carry the armament, equipment, coal, stores, and machinery, prescribed by the Naval Advisory Board and indicated in the annexed drawings and specifications, and that when the vessel is completed and ready for delivery, as required by the specifications, the same shall be subjected to a trial trip, under conditions prescribed by the Naval Advisory Board and approved by the Secretary of the Navy, to test the machinery, engines, boilers, and appurtenances, and shall be accepted only on fulfillment of, and subject to, the conditions and agreements hereinafter set forth:

(1.) That the working of said machinery in all its parts shall be to the satisfaction of the Naval Advisory Board.

(2.) That the collective indicated horse-power developed by said engines under the prescribed conditions shall be three thousand five hundred (3,500), and maintained successfully for six (6) consecutive hours; provided that, in case of the failure of the development of this power, the vessel shall be accepted if it can be shown to the satisfaction of the Naval Advisory Board and the Secretary of the Navy that this failure was due neither to defective workmanship nor materials.

(3.) It is further agreed and covenanted by the parties of the first part that, in event of the engines or work pertaining thereto not being duly completed, or if, at any time during four months after the said engines shall have been accepted, they shall be found to be defective in their original construction either with respect to workmanship or materials, or in event of the failure, breaking down, or deterioration, other than that due to fair wear and tear, of any part or parts of the engines or appurtenances, the same shall be repaired, to the entire satisfaction of the Secretary of the Navy, at the expense of the contractor.

(4.) The parties of the first part hereby further covenant and agree that the total weight of the said engines and machinery, boilers, appurtenances, and spare parts, complete as specified, and including water in the surface condensers and boilers, shall not exceed six hundred and sixty-four (664) tons, this weight to be determined from the certified records of the actual weight of the parts of the machinery as they are sent on board the vessel to be connected up. If this weight be exceeded by five per cent. the contractor shall pay a penalty of \$4,000 (four thousand dollars,) and also a penalty of \$400 (four hundred dollars) per ton for each ton of excess weight, over that stipulated, above the five per cent. excess, as ascertained and liquidated damages due the United States, to be deducted from instalments still due.

Tenth. If, at and upon the trial trip before mentioned, the hull and fittings are found by the Naval Advisory Board to be strong and well built and in strict conformity with the contract, drawings, and specifications, the same shall be accepted, and the final

payments made, including all reservations, subject, however, to a reserve of sixteen thousand (\$16,000) dollars from the reservations hereinafter set forth. This sum shall be held until the vessel has been finally tried when fully equipped, armed, and in all respects complete and ready for sea, under conditions prescribed by the Naval Advisory Board and approved by the Secretary of the Navy, provided that such trial shall take place within four months of the preliminary acceptance above mentioned.

If the vessel be not in readiness for such final trial within the time specified, through no fault or delay on the part of the contractors, and no defects in the hull due to either defective workmanship or materials shall have appeared, then the vessel shall be finally accepted and the reserve aforesaid paid.

If upon such final trial, or within four months from the date of the preliminary acceptance, said final trial not having taken place, any weakness or defect in the hull due to either bad workmanship or materials shall appear, the same must be repaired to the satisfaction of the Naval Advisory Board and the Secretary of the Navy, and at the expense of the contractors.

Eleventh. It is further mutually understood, covenanted, and agreed, that in case of the failure or omission of the contractors, at any stage of the work prior to final completion, from any cause other than the order of the Secretary of the Navy to go forward with the work and make satisfactory progress toward its completion within the prescribed time, it shall be optional with the said Secretary to declare this contract forfeited. The parties of the first part shall thereupon, and on notice thereof to them, or any one of them, in writing, be, and they do hereby, in consideration of the premises, jointly and severally, for themselves and their heirs and assigns, personal and legal representatives, acknowledge themselves to be, justly indebted to the United States, as for liquidated and ascertained damages, in a sum equal to the aggregate amount of all advance payments theretofore made to them for or on account of the work to be done under this contract, and do further jointly and severally, as aforesaid, covenant and agree to refund the same on demand, or within sixty days thereafter, and that the United States shall and may hold as collateral security for such refund the vessel, machinery, materials, and fittings, or so much thereof as shall then have been constructed or furnished or as shall be on hand for the purposes of construction. The Secretary of the Navy shall thereupon cause to be taken and filed a full and complete statement and inventory of all work done or commenced in, upon, or about the hull, machinery, and fittings of said vessel, and of all materials on hand applicable thereto, and shall cause the same to be duly valued by a Board consisting of not less than five persons qualified by knowledge and experience for the discharge of their duties, to be appointed by the Secretary of the Navy, which Board shall proceed without unnecessary delay to examine such work and materials and ascertain and declare the fair market value thereof, including a reasonable and customary margin of profit upon so much of the work as shall have been, at the time such forfeiture is declared, satisfactorily performed; and upon such examination the parties of the first part may attend in person and by counsel and submit such evidence as the Board may deem proper.

Twelfth. Upon receipt of the report and finding of said Board, and upon his approval thereof, the Secretary of the Navy may, in his discretion, proceed to complete the vessel, machinery, and fittings, in accordance with the contract, plans, and specifications, using for that purposes all suitable materials on hand and included in the inventory aforesaid; and the title to said vessel, machinery, and fittings, or so much thereof as shall have been completed, and to all such materials, shall forthwith vest in the United States; and the parties of the first part do hereby, for themselves, their heirs and assigns, personal and legal representatives, jointly and severally covenant and agree to and with the United States that, on receiving notice of the intention of the Secretary of the Navy to proceed to the completion of the work, they will surrender the same and all materials on hand, together with the use of the yard or "plant," and all machinery, tools, and appliances appertaining thereto and theretofore used or necessarily to be used in and about the completion of the work.

Thirteenth. In case the Secretary of the Navy shall proceed, under the foregoing clause, to complete the work, such procedure shall be without unnecessary delay, and shall be at the risk and expense of the parties of the first part, who shall be chargeable with any increase in the cost of materials or labor incurred by reason of the failure of the contractors to perform the contract. Upon the final settlement of the liability of the parties of the first part an account shall be stated substantially as follows:

The contractors shall be charged—

1. With all advance payments.
2. With the extra cost, if any, of materials and labor, and all other extra expenses, if any, over and above the contract price, incurred in the completion of the work.

They shall then be credited with the value of the work done up to the time of suspension, and of the materials on hand, as ascertained by the Board and approved by the Secretary of the Navy under the provisions of the eleventh clause of this contract, and with such advance payments, if any, as may have been refunded. If a balance shall thereupon appear in favor of the contractors, the same shall be paid to and ac-

cepted by them in full discharge of all claims under this contract; but if a balance shall appear in favor of the United States, the parties of the first part hereby covenant and agree as aforesaid to pay and discharge the same on demand.

Fourteenth. It is mutually understood, covenanted, and agreed, by and between the respective parties that it shall not, under any circumstances, be obligatory upon the party of the second part to accept the vessel or any part thereof to be constructed under this contract unless the same shall have been completed in strict conformity with this contract, under the supervision of the Naval Advisory Board, and in accordance with the provisions of the act of August 5, 1882, as modified by the act of March 3, 1883, hereinbefore referred to, and that this qualification shall be deemed and taken as applicable and applying to each and every clause, covenant, and condition, express or implied, in this contract contained.

Fifteenth. It is hereby mutually and expressly covenanted and agreed, and this contract is upon the express condition, that no member of or Delegate to Congress, nor any officer of the United States, naval, military, or civil, is, or shall be, admitted to any share or part of this contract, or to any benefit to arise therefrom.

Sixteenth. The United States, in consideration of the premises, do hereby contract, promise, and engage to and with the parties of the first part as follows:

1. The contract price to be paid for the vessel, machinery, and fittings, to be constructed and furnished in accordance with this contract, shall be \$619,000 (six hundred and nineteen thousand dollars).

2. Payments shall be made by the United States in ten equal instalments, as the work progresses, with a reservation of ten per cent. from each instalment.

3. No payment shall be made except upon bills, in triplicate, certified by the inspectors and Naval Advisory Board in such manner as shall be directed by the Secretary of the Navy, whose final approval of all bills thus certified shall be necessary before payment thereof.

4. All warrants for payments under this contract shall be made payable to the contractors or their order.

5. The last payment shall not be made until this contract shall have been fully performed by or on the part of the parties of the first part, and the vessel, machinery, and fittings shall have been accepted by the party of the second part, as in the tenth clause of this contract hereinbefore recited.

6. When all the conditions, covenants, and provisions of this contract shall have been performed and fulfilled by and on the part of the contractors they shall be entitled, within ten days after the filing and acceptance of their claim, to receive the aggregate amount of the reservations from the respective payments made to them during the progress of the work, on the execution of a final release to the United States, in such form as shall be approved by the Secretary of the Navy, of all claims of any kind or description under or by virtue of this contract.

Seventeenth. If any doubts or disputes arise as to the meaning of anything in the drawings or specifications, or if any discrepancy appear between the drawings and specifications and this contract, the matter shall be at once referred to the Secretary of the Navy for determination, and the parties of the first part hereby bind themselves and their heirs and assigns, personal and legal representatives, to abide by his decision in the premises.

In witness whereof the respective parties have hereunto set their hands and seals the day and year first above written.

JOHN ROACH. [L. S.]
LEVI KERR. [L. S.]
THOMAS F. ROWLAND. [L. S.]

Signed and sealed in presence of—

JAMES MOONEY.
GEO. E. WEED.

THE UNITED STATES,
By WM. E. CHANDLER, [L. S.]
Secretary of the Navy.

To signature of Wm. E. Chandler:

JESSE E. DOW,
Act'g Chief Clerk Navy Department.

NOTE.—The tests of steel for the Boston, Atlanta and Dolphin are the same as for the Chicago. The contract for the Atlanta is the same as that for the Boston.

Bond accompanying the contract for the construction of a steam cruiser of about 3,000 tons displacement.

BOSTON.

Know all men by these presents, that we, John Roach, of the county of New York, in the State of New York, as principal, Levi Kerr, of the city of Cleveland, of the county of Cuyahoga, in the State of Ohio, and Thos. F. Rowland, of the county of New York, in the State of New York, as sureties, are held and firmly bound unto the United States of America in the full and just sum of three hundred thousand dollars, lawful money of the United States, to be paid to the said United States; for which payment, well and truly to be made, we bind ourselves and our heirs, executors, and administrators, jointly and severally, firmly by these presents. Sealed with our seals, and dated this twenty-third day of July, Anno Domini one thousand eight hundred and eighty-three.

The condition of the above obligation is such, that if the above bound John Roach shall well and truly perform the stipulations of the contract hereunto annexed, entered into with the Secretary of the Navy, for and in behalf of the United States, agreeing to construct a steam cruiser of about 3,000 tons displacement, conforming in all respects to said contract, and plans and specifications attached thereto and forming a part thereof, then the above obligation to be void and of no effect; otherwise, to be and remain in full force and virtue.

JOHN ROACH. [SEAL.]
LEVI KERR. [SEAL.]
THOS. F. ROWLAND. [SEAL.]

Signed, sealed, and delivered in the presence of—

JAMES MOONEY.
GEO. E. WEED.

Bondsman's oaths.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public, in and for the county and State above named, personally appeared Levi Kerr, by occupation a banker, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of one hundred and fifty thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property lying in the county of Cuyahoga and State of Ohio, and personal property in the county of New York

LEVI KERR.

Sworn and subscribed before me this 23d day of July, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County of New York.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public, in and for the county and State above named, personally appeared Thos. F. Rowland, by occupation a gas-works builder, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of one hundred and fifty thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property in the city of Brooklyn, lying in the county of Queens, and State of New York.

THOS. F. ROWLAND.

Sworn and subscribed before me this 23d day of July, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County New York.

NAVY PAY OFFICE, No. 27 STATE STREET,
New York, August 13, 1883.

I hereby certify that Levi Kerr and Thos. F. Rowland, the persons named in and who executed the foregoing bond, are to me well known; that they are residents of Cleveland, Ohio, and New York City, and are, in my opinion, good and sufficient sureties for the purposes mentioned in said bond.

THOS. T. CASWELL, [L. S.]
Pay Inspector, U. S. N.

Contract for the construction of a dispatch-boat of about 1,500 tons displacement.

DOLPHIN.

Contract, of two parts, made and concluded this 23d day of July, A. D. 1883, between John Roach, of the city, county, and State of New York as principal, and Levi Kerr, of the city of Cleveland, State of Ohio, and Alfred R. Whitney, of the city, county, and State of New York as sureties, parties of the first part, and the United States, represented by William E. Chandler, Secretary of the Navy, party of the second part.

Whereas the act making appropriations for the naval service for the year ending June 30, 1884, approved March 3, 1883, made an appropriation for the construction of a steel cruiser of not less than 4,300 tons displacement, then specially authorized by law; two steel cruisers of not more than 3,000 nor less than 2,500 tons displacement each, and one dispatch boat; and authorized the Secretary of the Navy to construct said vessels;

And whereas, after due advertisement, the proposal of the said principal party of the first part for the construction of the hull and machinery of one of said vessels, to wit, a dispatch boat of about 1,500 tons displacement, has been duly accepted by the Secretary of the Navy;

And whereas the drawings and specifications required by the act of August 5, 1882, have been duly provided, adopted, and approved in accordance with the provisions of said act relating thereto;

Now, therefore, this contract witnesseth that, in consideration of the premises and for and in consideration of the payments hereinafter provided for, the parties of the first part, for themselves, their heirs and assigns, personal and legal representatives, do hereby covenant and agree to and with the United States as follows, that is to say:

First. The said parties of the first part will, at their own risk and expense, construct, in conformity with the aforesaid plans and specifications hereto annexed, and in accordance with the provisions of the acts of Congress approved August 5, 1882, and March 3, 1883, respectively, before mentioned and relating thereto, one dispatch-boat of about 1,500 tons displacement, with fittings as specified, of the following principal dimensions:

Length between perpendiculars	240 feet.
Extreme breadth	32 feet.
Depth in hold	18 feet 2 inches,

and provided and fitted with machinery, engines, and boilers complete in all their parts, appurtenances, and spare parts, and in all respects as described in the specifications, and deliver the same at the port of New York, N. Y., or Norfolk, Va., to such persons as the Secretary of the Navy may direct to receive the same, at either of said ports.

Second. The construction of the hull and machinery, and the fittings of the vessel, shall conform in all respects to and with the plans and specifications hereto annexed, which plans and specifications shall be deemed and taken as forming part of this contract with the like operation and effect as if the same were incorporated therein. No omission, in the plans or specifications, of any detail, object, or provision necessary to carry this contract into full and complete effect, in accordance with the object and intent of the acts of Congress above mentioned, shall operate to the disadvantage of the United States, but the same shall be satisfactorily supplied, performed, and observed by the parties of the first part, and all claims for extra compensation by reason of, or for or on account of, such extra performance, are hereby and in consideration of the premises expressly waived; and it is hereby further provided, and this contract is upon the express condition, that the drawings and specifications provided, adopted, and approved as herein before mentioned, shall not be changed in any respect, when the cost of such change shall, in the construction, exceed five hundred dollars, except upon the approval of the Naval Advisory Board, or a majority thereof, in writing, and the written order of the Secretary of the Navy; and if changes are thus made, the actual cost thereof and the damage caused thereby, and the amount of the increased or diminished compensation which the contractors shall be entitled to receive, if any, in consequence of such change or changes, shall be ascertained, estimated, and determined by said Board, or a majority thereof, which determination shall be binding upon the parties of the first part, who hereby expressly covenant and agree to accept and abide by such determination.

Third. The materials and workmanship used and applied in the construction of the hull and machinery and fittings of said vessel, in details and finish, shall be first class and of the very best quality, and shall, from the beginning to the end of the work, be subject to the inspection of the Naval Advisory Board, and said Board shall have general supervision of the work under the direction of the Secretary of the Navy; it being hereby expressly understood, covenanted, and agreed that the said Secretary may appoint suitable inspectors, acting under the direction of the Naval Advisory

Board, to whom the contractors agree to furnish such samples, and such information as to the quality thereof and the manner of using the same, as may be required, and also any assistance they may require in determining the weight and quality of steel and other metals, and of wood and other materials, either used or intended for use in the construction of said vessel or machinery; and the inspectors may, with the approval of the Naval Advisory Board, peremptorily reject any unfit material or forbid the use thereof. The Naval Advisory Board and the inspectors shall, at all times during the progress of the work, have full access thereto, and the contractors shall furnish them with full facilities for the inspection and superintendence of the same.

Fourth. The steel to be used in the construction of the hull and boilers of the vessel to be built under this contract shall conform to the "tests of steel for cruisers" prescribed by the Naval Advisory Board, and approved by the Secretary of the Navy, June 18, 1883, the same being annexed to and forming a part of this contract.

Fifth. It is hereby agreed by the contractors that such plans as it may be necessary to prepare during the progress of the work shall be at their expense, and shall be submitted to the Naval Advisory Board for approval before the material is ordered or the work commenced.

Sixth. The parties of the first part, in consideration of the premises, hereby covenant and agree to hold and save the United States harmless from and against all and every demand or demands of any nature or kind for or on account of the adoption of any plan, model, design, or suggestion, or for or on account of the use of any patented invention, article, or appliance which has been or may be adopted or used in or about the construction of the hull, machinery, and fittings of said vessel, or any part thereof, under this contract, and to protect and discharge the Government from all liability on account thereof by proper releases from patentees or otherwise, and to the satisfaction of the Secretary of the Navy, before final payment under this contract shall be made.

Seventh. The hull, machinery, and fittings of the vessel to be constructed under this contract, shall be completed and ready for inspection for the purpose of delivery to the United States on or before the expiration of twelve months from the date of this contract; but the lien of the United States upon said hull, machinery, and fittings, respectively and collectively, for all moneys advanced on account thereof, shall commence with the first payment, and shall thereupon attach to so much of the work and materials as shall then have been performed and furnished, and shall in like manner attach from time to time as the work progresses and as further payments are made, and shall continue until the same shall have been properly discharged.

Eighth. The hull, machinery, and fittings, embraced by this contract, and all materials and appliances provided for and used or to be used in the construction thereof, shall be kept duly insured, which insurance shall be renewed and increased from time to time, by and at the expense of the parties of the first part, in an amount sufficient to cover all advance payments made under this contract, the loss, if any, to be stated in the policies as payable to the United States, and the insurance shall be effected in such manner and in such companies as shall be approved by the Secretary of the Navy.

Ninth. The parties of the first part hereby further agree that the vessel constructed under this contract shall be sufficiently strong to carry the armament, equipment, coal, stores, and machinery, prescribed by the Naval Advisory Board and indicated in the annexed drawings and specifications, and that when the vessel is completed and ready for delivery, as required by the specifications, the same shall be subjected to a trial trip, under conditions prescribed by the Naval Advisory Board, and approved by the Secretary of the Navy, to test the machinery, engines, boilers, and appurtenances, and shall be accepted only on fulfillment of, and subject to, the conditions and agreements hereinafter set forth:

(1.) That the working of said machinery in all its parts shall be to the satisfaction of the Naval Advisory Board.

(2.) That the collective indicated horse-power developed by said engines under the prescribed conditions shall be two thousand three hundred (2,300), and maintained successfully for six (6) consecutive hours; provided that, in case of the failure of the development of this power, the vessel shall be accepted if it can be shown to the satisfaction of the Naval Advisory Board and the Secretary of the Navy that this failure was due neither to defective workmanship nor materials.

(3.) It is further agreed and covenanted by the parties of the first part that, in event of the engines or work pertaining thereto not being duly completed, or if, at any time during four months after the said engines shall have been accepted, they shall be found to be defective in their original construction either with respect to workmanship or materials, or in event of the failure, breaking down, or deterioration, other than that due to fair wear and tear, of any part or parts of the engines or appurtenances, the same shall be repaired, to the entire satisfaction of the Secretary of the Navy, at the expense of the contractor.

(4.) The parties of the first part hereby further covenant and agree that the total weight of the said engines and machinery, boilers, appurtenances, and spare parts, complete as specified, and including water in the surface condensers and boilers, shall

not exceed four hundred and thirty (430) tons, this weight to be determined from the certified records of the actual weight of the parts of the machinery as they are sent on board the vessel to be connected up. If this weight be exceeded by five percent, the contractor shall pay a penalty of \$2,000 (two thousand dollars), and also a penalty of \$200 (two hundred dollars) per ton for each ton of excess weight, over that stipulated, above the five per cent. excess, as ascertained and liquidated damages due the United States, to be deducted from instalments still due.

Tenth. If, at and upon the trial trip before mentioned, the hull and fittings are found by the Naval Advisory Board to be strong and well built and in strict conformity with the contract, drawings, and specifications, the same shall be accepted, and the final payments made, including all reservations, subject, however, to a reserve of eight thousand (\$8,000) dollars from the reservations hereinafter set forth. This sum shall be held until the vessel has been finally tried when fully equipped, armed, and in all respects complete and ready for sea, under conditions prescribed by the Naval Advisory Board and approved by the Secretary of the Navy, provided that such trial shall take place within three months of the preliminary acceptance above mentioned.

If the vessel be not in readiness for such final trial within the time specified, through no fault or delay on the part of the contractors, and no defects in the hull due to either defective workmanship or materials shall have appeared, then the vessel shall be finally accepted and the reserve aforesaid paid.

If upon such final trial, or within three months from the date of the preliminary acceptance, said final trial not having taken place, any weakness or defect in the hull due to either bad workmanship or materials shall appear, the same must be repaired to the satisfaction of the Naval Advisory Board and the Secretary of the Navy, and at the expense of the contractors.

Eleventh. It is further mutually understood, covenanted, and agreed, that in case of the failure or omission of the contractors, at any stage of the work prior to final completion, from any cause other than the order of the Secretary of the Navy, to go forward with the work and make satisfactory progress towards its completion within the prescribed time, it shall be optional with the said Secretary to declare this contract forfeited. The parties of the first part shall thereupon, and on notice thereof to them, or any one of them, in writing, be, and they do hereby, in consideration of the premises, jointly and severally, for themselves and their heirs and assigns, personal and legal representatives, acknowledge themselves to be justly indebted to the United States, as for liquidated and ascertained damages, in a sum equal to the aggregate amount of all advance payments theretofore made to them for or on account of the work to be done under this contract, and do further jointly and severally, as aforesaid, covenant and agree to refund the same on demand, or within sixty days thereafter, and that the United States shall and may hold as collateral security for such refund the vessel, machinery, materials, and fittings, or so much thereof as shall then have been constructed or furnished or as shall be on hand for the purposes of construction. The Secretary of the Navy shall thereupon cause to be taken and filed a full and complete statement and inventory of all work done or commenced in, upon, or about the hull, machinery, and fittings of said vessel, and of all materials on hand applicable thereto, and shall cause the same to be duly valued by a Board consisting of not less than five persons qualified by knowledge and experience for the discharge of their duties, to be appointed by the Secretary of the Navy, which Board shall proceed without unnecessary delay to examine such work and materials and ascertain and declare the fair market value thereof, including a reasonable and customary margin of profit upon so much of the work as shall have been, at the time such forfeiture is declared, satisfactorily performed; and upon such examination the parties of the first part may attend in person and by counsel and submit such evidence as the Board may deem proper.

Twelfth. Upon receipt of the report and finding of said Board, and upon his approval thereof, the Secretary of the Navy may, in his discretion, proceed to complete the vessel, machinery, and fittings, in accordance with the contract, plans, and specifications, using for that purposes all suitable materials on hand and included in the inventory aforesaid; and the title to said vessel, machinery, and fittings, or so much thereof as shall have been completed, and to all such materials, shall forthwith vest in the United States; and the parties of the first part do hereby, for themselves, their heirs, and assigns, personal and legal representatives, jointly and severally covenant and agree to and with the United States that, on receiving notice of the intention of the Secretary of the Navy to proceed to the completion of the work, they will surrender the same and all materials on hand, together with the use of the yard or "plant," and all machinery, tools, and appliances appertaining thereto and theretofore used or necessarily to be used in and about the completion of the work.

Thirteenth. In case the Secretary of the Navy shall proceed, under the foregoing clause, to complete the work, such procedure shall be without unnecessary delay, and shall be at the risk and expense of the parties of the first part, who shall be chargeable with any increase in the cost of materials or labor incurred by reason of the failure of the contractors to perform the contract. Upon the final settlement of

the liability of the parties of the first part an account shall be stated substantially as follows:

The contractors shall be charged—

1. With all advanced payments.
2. With the extra cost, if any, of materials and labor, and all other extra expenses, if any, over and above the contract price, incurred in the completion of the work.

They shall then be credited with the value of the work done up to the time of suspension, and of the materials on hand, as ascertained by the Board and approved by the Secretary of the Navy under the provisions of the eleventh clause of this contract, and with such advanced payments, if any, as may have been refunded. If a balance shall thereupon appear in favor of the contractors, the same shall be paid to and accepted by them in full discharge of all claims under this contract; but if a balance shall appear in favor of the United States, the parties of the first part hereby covenant and agree as aforesaid to pay and discharge the same on demand.

Fourteenth. It is mutually understood, covenanted, and agreed, by and between the respective parties, that it shall not, under any circumstances, be obligatory upon the party of the second part to accept the vessel or any part thereof to be constructed under this contract unless the same shall have been completed in strict conformity with this contract, under the supervision of the Naval Advisory Board, and in accordance with the provisions of the act of August 5, 1882, as modified by the act of March 3, 1883, hereinbefore referred to, and that this qualification shall be deemed and taken as applicable and applying to each and every clause, covenant, and condition, express or implied, in this contract contained.

Fifteenth. It is hereby mutually and expressly covenanted and agreed, and this contract is upon the express condition, that no member of or delegate to Congress, nor any officer of the United States, naval, military, or civil, is, or shall be, admitted to any share or part of this contract, or to any benefit to arise therefrom.

Sixteenth. The United States, in consideration of the premises, do hereby contract, promise, and engage to and with the parties of the first part as follows:

1. The contract price to be paid for the vessel, machinery, and fittings, to be constructed and furnished in accordance with this contract, shall be \$315,000 (three hundred and fifteen thousand dollars).

2. Payment shall be made by the United States in ten equal instalments, as the work progresses, with a reservation of ten per cent. from each installment.

3. No payment shall be made except upon bills, in triplicate, certified by the inspectors and Naval Advisory Board in such manner as shall be directed by the Secretary of the Navy, whose final approval of all bills thus certified shall be necessary before payment thereof.

4. All warrants for payments under this contract shall be made payable to the contractors or their order.

5. The last payment shall not be made until this contract shall have been fully performed by or on the part of the parties of the first part, and the vessel, machinery, and fittings shall have been accepted by the party of the second part, as in the tenth clause of this contract hereinbefore recited.

6. When all the conditions, covenants, and provisions of this contract shall have been performed and fulfilled by and on the part of the contractors they shall be entitled, within ten days after the filing and acceptance of their claim, to receive the aggregate amount of the reservations from the respective payments made to them during the progress of the work, on the execution of a final release to the United States, in such form as shall be approved by the Secretary of the Navy, of all claims of any kind or description under or by virtue of this contract.

Seventeenth. If any doubts or disputes arise as to the meaning of anything in the drawings or specifications, or if any discrepancy appear between the drawings and specifications and this contract, the matter shall be at once referred to the Secretary of the Navy for determination, and the parties of the first part hereby bind themselves and their heirs and assigns, personal and legal representatives, to abide by his decision in the premises.

In witness whereof the respective parties have hereunto set their hands and seals the day and year first above written.

Signed and sealed in presence of—

JAMES MOONEY.
GEO. E. WEED.

JOHN ROACH. [L. S.]
LEVI KERR. [L. S.]
A. R. WHITNEY. [L. S.]

THE UNITED STATES, [L. S.]
By WM. E. CHANDLER, [L. S.]
Secretary of the Navy.

To signature of Wm. E. Chandler:

CHARLES A. GORE,
Ensign, U. S. Navy.

NOTE.—The tests of steel for the Dolphin are the same as those for the Chicago.

Bond accompanying the contract for the construction of a dispatch boat of about 1,500 tons displacement.

DISPATCH BOAT.

Know all men by these presents that we, John Roach, of the county of New York, in the State of New York, as principal, Levi Kerr, of the city of Cleveland, of the county of Cuyahoga, in the State of Ohio, and Alfred R. Whitney, of the county of New York, in the State of New York, as sureties, are held and firmly bound unto the United States of America in the full and just sum of one hundred and fifty thousand dollars, lawful money of the United States, to be paid to the said United States; for which payment, well and truly to be made, we bind ourselves and our heirs, executors, and administrators, jointly and severally, firmly by these presents. Sealed with our seals, and dated this 23d day of July, anno Domini one thousand eight hundred and eighty-three.

The condition of the above obligation is such, that if the above bound John Roach, shall well and truly perform the stipulations of the contract hereunto annexed, entered into with the Secretary of the Navy, for and in behalf of the United States, agreeing to construct a dispatch boat of about 1,500 tons displacement, conforming in all respects to said contract, and plans and specifications attached thereto and forming a part thereof, then the above obligation to be void and of no effect; otherwise, to be and remain in full force and virtue.

JOHN ROACH. [SEAL.]
LEVI KERR. [SEAL.]
A. R. WHITNEY. [SEAL.]

Signed, sealed, and delivered in the presence of—

JAMES MOONEY.
GEO. E. WEED.

Bondsman's oaths.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public, in and for the county and State above named, personally appeared Levi Kerr, by occupation a banker, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of seventy-five thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property lying in the county of Cuyahoga and State of Ohio, and personal property in the county of New York and State of New York.

LEVI KERR.

Sworn and subscribed before me this 23d day of July, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County New York.

STATE OF NEW YORK,
County of New York, ss:

Before me, a notary public, in and for the county and State above named, personally appeared Alfred R. Whitney, by occupation a merchant, one of the persons named in and who executed the foregoing bond, and made oath in solemn form that he is worth the sum of seventy-five thousand dollars, over and above his legal liabilities; and that his property consists of real estate and personal property lying in the county of New York and State of New York.

A. R. WHITNEY.

Sworn and subscribed before me this 13th day of August, A. D. 1883.

[SEAL.]

GEO. E. WEED,
Notary Public, County New York.

NAVY PAY OFFICE, No. 27 STATE STREET,
New York, August 13, 1883.

I hereby certify that Levi Kerr and A. R. Whitney, the persons named in and who executed the foregoing bond, are to me well known; that they are residents of Cleveland, Ohio, and New York City, and are, in my opinion, good and sufficient sureties for the purposes mentioned in said bond.

THOS. T. CASWELL, [L. S.]
Pay Inspector, U. S. N.

ARMORED VESSELS.

REPORT OF THE NAVAL ADVISORY BOARD.

NAVAL ADVISORY BOARD,
Washington, October 25, 1883.

SIR: The Board respectfully present this final report, completing its duty required by the act of Congress of August 5, 1882, in regard to whether any changes should be made in the original plans of the Puritan, Monadnock, Terror, and Amphitrite.

Attention is respectfully directed to the Board's preceding reports as follows:

Inclosure A, dated December 15, 1882, giving reasons for considering it wise and expedient to finish the monitors.

Inclosure B, dated January 11, 1883, giving in detail the changes recommended in plans of Puritan and the cost of completion.

Inclosure C, dated April 5, 1883, in compliance with the Department order of March 9, 1883, preparatory to the execution of the provisions of the act of Congress of March 3, 1883, requiring the approval of the Board to the contracts for the completion of the machinery of the monitors.

Inclosure D, dated May 31, 1883, giving estimates for the cost of completion of the machinery of the monitors.

Inclosure E, dated June 15, 1883, approving the contracts for the completion of the machinery of the Puritan, Terror, and Amphitrite.

PURITAN.

In carrying out the Board's recommendations in regard to the machinery (Inclosure C) it is necessary to reduce the coal supply by 100 tons; in making the detailed drawing of the turrets and loading appliances it has been found practicable to reduce the internal diameter from 22 to 19 feet. The consequent reduction in weight due to these changes and those in the arrangement of the turret chambers renders it possible to considerably increase the fighting power and efficiency of the Puritan by adding to the ammunition allowance, by increasing the thickness of the armor throughout the deck by as nearly 1 inch as the weights will allow, by increasing the side armor for 181 feet amidships from 11 to 12 inches for a depth of 3 feet 6 inches, and increasing the armor on the turrets from 14 to 15 inches in thickness.

These changes are included in the plans prepared by the Board, and the total cost to complete the Puritan according to these plans, will be for

HULL,

To complete according to the present plans, with changes in side armor, deck armor, turrets, smoke-pipe, ventilators, and anchors.....	\$1, 027, 000 00
Less amount paid for launching.....	\$21, 975 00
Less amount on hull paid under contract of June, 1883....	45, 123 44
Balance of tenth payment due under contract of March, 1875, already appropriated	4, 560 00
	71, 658 44
Total.....	955, 341 56

MACHINERY.

Two separate pairs of engines, gears, pipes, as per drawing, for turning turret	13,890 00
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ORDNANCE.

Four 10½ breech-loading rifles, with hydraulic apparatus, four Hotchkiss guns, four Gatling guns, electric light, &c., and torpedo outfit.	172,250 00
Total to complete	1,141,481 56

TERROR, AMPHITRITE, AND MONADNOCK.

The Board recommends that the turrets of these vessels be of the roller-base pattern, with central ammunition supply, and arrangements for independent loading at any point; that the armament consist of four 10-inch high-powered breech-loading rifled guns, with hydraulic loading and recoil mechanism, together with the same machine gun, small-arm, torpedo, and electric outfit as prescribed for the Puritan; that the armor of the turrets and side be either steel or steel-faced, that of the turrets to consist of 11½ plates with 12½ port plates, arranged, backed, and fastened in the same manner as proposed by the Department for the Miantonomoh; that on the side to consist of plates of a single depth and of the following thicknesses for a distance of about 136 feet amidships: 7 inches from the top to a depth of 36 inches, thence tapering to 4 inches at the bottom: from the forward end of this section to the bow and from the after end to a length of about 21 feet, the thickness to be 7 inches from the top to a depth of 36 inches, thence tapering to 4 inches at the bottom; from the ends of this section around the stern, 6 inches thick throughout.

Estimates.

TERROR.

HULL.

To complete according to present plans, with changes in turrets, side armor	\$688,500 00
Less amount paid for launching	\$15,539 00
Less balance of reservations on contract of March 1875, already appropriated	12,500 00
Less amount on hull to be paid under contract of June, 1883.	33,173 32
	61,212 32
Total	627,287 68

MACHINERY.

Two pairs of engines, gear-pipes, &c., as per drawings for turning turret.	11,500 00
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ORDNANCE.

Four 10-inch B. L. R., with hydraulic apparatus, four Hotchkiss guns, four Gatling guns, electric light, &c., and torpedo outfit	146,480 00
Total to complete	785,267 68

AMPHITRITE.

HULL.

Items same as for Terror.....		\$688,500 00
Less amount paid for launching.....	\$14,774 00	
Less balance of reservation on contract of March, 1875, already appropriated.....	1,300 00	
Less amount on hull to be paid under contract of June, 1883.	33,172 32	
		48,916 32
Total.....		639,583 68

MACHINERY.

Items same as for Terror	11,500 00
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ORDNANCE.

Items same as for Terror.....	146,480 00
Total to complete.....	797,563 68

MONADNOCK.

Hull to be built in California.

Items same as for Terror		\$785,500 00
Less amount paid for launching.....	\$44,834 00	
Less amount to be paid for hull under contract of June, 1883.	35,172 32	
Less balance of reservation under contract of March, 1875.	4,051 98	
		84,058 30
Total.....		701,441 70

MACHINERY.

Items same as for Terror	11,500 00
Ordnance to be fitted in California.	
Items same as for Terror	161,128 00
Total to complete Monadnock	874,069 70
Total to complete all monitors.....	3,598,382 62

The recommendation of the roller-base turret for these vessels is made on account of the necessity of making estimates on some actual basis. In case of the success of the tests upon the target representing Clark's deflective turret and the examination of his final designs should result in a recommendation of his system for these ships, it is considered that turrets of the Clark system may be substituted without affecting the estimates.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, United States Navy, President of the Board.

HENRY STEERS,
Naval Architect and Member.

MIERS CORYELL,
Marine Engineer and Member.

ALEX. HENDERSON,
Chief Engineer, United States Navy, and Member.

J. A. HOWELL,
Commander, United States Navy, and Member.

EDWARD W. VERY,
Lieutenant, United States Navy, and Member.

F. L. FERNALD,
Naval Constructor, United States Navy, and Member.

Hon. W. E. CHANDLER,
Secretary of the Navy.

[Inclosure A. Naval Advisory Board, October 25, 1883.]

NAVAL ADVISORY BOARD,
Washington, December 15, 1882.

SIR: In compliance with the act of Congress of August 5, 1882, requiring this Board to report as to the wisdom and expediency of completing the monitors *Puritan*, *Terror*, *Amphitrite*, and *Monadnock*, we have the honor to report that we have made personal examinations of the hulls of these vessels, except the *Monadnock*, which was examined by the president of the Board. We have also examined thoroughly all the reports that have been made by previous boards, by the Admiral of the Navy, and by the other authorities, and we have also examined, as far as possible, all the literature pertaining to foreign armored vessels of corresponding size.

It is our opinion that it would be wise and expedient to finish these vessels at once, and for the following reasons, viz:

1st. The hulls, as they are at present, are of excellent workmanship, fully up to the present standard of iron ship construction, whilst the flotation of the *Puritan* and the behavior of the *Miantonomoh* at sea confirm the correctness of the calculations of the designs.

2d. It is easily possible to complete the vessels by taking advantage of the recent developments in armor, guns, and machinery, without making any radical changes in the designs, so that their speed, endurance, battery power, protection, and sea-going qualities shall be fully equal to those of any foreign iron-clad of similar dimensions designed previous to 1879.

3d. The vessels may be finished so as to develop all the above-mentioned advantages without making their total cost when completed in any way exorbitant compared with the value of the results obtained; again, the interests of our sea-coast defense require a force at least equal to that which would be represented by those vessels.

We take the liberty of calling your attention to a certain erroneous impression which now exists with regard to these vessels. In one of the official reports upon these hulls a doubt was thrown upon the correctness of the calculations of the *Puritan*. This doubt has spread in the public mind until it includes all the ships. The actual flotation of the *Puritan* and the *Miantonomoh* proves beyond question not only the entire reliability of the calculations, but also that the hulls of these vessels are lighter in proportion to the total displacement than those of any iron-clad low-freeboard hulls afloat, with but two exceptions.

It has been the unfortunate custom, in arguments as to the value of the results to be obtained, to compare them with such foreign ships as the *Inflexible* and *Duilio* to the evident disadvantage of the monitors, no account whatever being taken of the fact that these vessels are double the size of the monitors.

If these hulls be compared with foreign ones of similar dimensions, no such disparity will appear.

The Board has the honor to report that it will be prepared before the end of January to submit complete and detailed plans, together with the estimates of cost, for the completion of the *Puritan*. With regard to the other vessels, their inferior dimensions will require more time and

more careful examination to prepare detailed designs that shall give them the highest possible efficiency.

Very respectfully,

R. W. SHUFELDT,
Commodore, United States Navy, President of the Board.

HENRY STEERS,
Member.

MIERS CORYELL,
Member.

ALEXANDER HENDERSON,
Chief Engineer, United States Navy.

J. A. HOWELL,
Commander, United States Navy.

EDWARD W. VERRY,
Lieutenant, United States Navy.

F. L. FERNALD,
Naval Constructor, United States Navy.

Hon. W. E. CHANDLER,
Secretary of the Navy.

[Inclosure B. Naval Advisory Board, October 25, 1883.]

No. 28.

NAVAL ADVISORY BOARD,
Washington, January 11, 1883.

SIR: The Board respectfully present the following comparison of the Puritan with foreign ships as an appendix to our report of this date:

In order that a true estimate may be made of the value of the Puritan as a fighting vessel when completed in accordance with the foregoing recommendations, we make the following summarized comparison of the ship with two vessels of a closely corresponding type and size, which represent the latest developments in the English and French naval architecture applied to coast defense.

TURRET SHIPS.

In the British navy list, the Conqueror (now building) approximates quite closely to the Puritan in dimensions and type; and in the French navy list the Tonnerre and class, although somewhat smaller ships, are close enough in size to admit of direct comparison.

Measurement.	Conqueror.	Puritan.	Tonnerre.
Local displacement	6,200	6,060	5,580
Length between perpendiculars	270	280	241 $\frac{1}{2}$
Extreme breadth	58	60	57 $\frac{1}{2}$
Mean draught	23	18	20 $\frac{3}{8}$
Immersed midship section	1,145	1,037	1,099
Indicated horse-power	4,500	4,167	4,166
Maximum speed	*13	†13 $\frac{1}{4}$	†14
Coal supply	650	514	270
Armament	2 12-inch B. L. R. 2 6-inch B. L. R.	4 10 $\frac{1}{2}$ -inch B. L. R.	2 10 $\frac{1}{2}$ -inch B. L. R.
Number of turrets	1	2	1
Thickness of turret armor	12	14	13 $\frac{1}{4}$
Thickness of deck armor	2 $\frac{1}{2}$ and 1 $\frac{3}{4}$	3 and 2	2
Thickness of side armor, amidships	12	11	13
Thickness of side armor, bow	8 $\frac{1}{2}$	10	9.8
Thickness of side armor, quarter	11	10	11.8
Thickness of side armor, stern	0	8	11.8

* Estimated.

† Actual.

MANEUVERING POWER.

The Conqueror was designed with especial regard to the full development of ramming power, necessitating the greatest possible handiness.

An examination of the measurements will show that the proportion of length to breadth is the same as that of the Puritan, whilst the latter has the great superiority in her lighter draught, which, taken in connection with her greater speed and greater number of guns and powerful ram-bow, gives her, in the opinion of the Board, a marked superiority over the English ship in maneuvering power. On the other hand, the Tonnerre, being shorter in proportion to her beam, and having a higher speed, should possess greater mobility, but this quality is greatly modified, if not completely neutralized, by her excessive draught of water.

SPEED AND ENDURANCE.

The speed of the Puritan is superior to that of the Conqueror, whilst it is inferior to that of the Tonnerre. This superiority of the French ship is, however, gained at a great sacrifice of coal capacity or endurance; so great, indeed, as, in the opinion of the Board, to entirely unfit her for any prolonged operations at a distance from a coaling station. The endurance of the Puritan and the Conqueror is the same.

ARMAMENT.

In the power of individual guns the Conqueror is superior to the Puritan, whilst the latter is in about the same proportion superior to the Tonnerre. Since, however, the Puritan's guns have sufficient power to overcome the armor of both the other ships, the efficiency of the armament depends directly upon the number of guns which the ship can bring into action. In this respect the Puritan has a marked superiority over both the other ships, since she has double the number of guns. The 6-inch guns of the Conqueror are left out of consideration, as they are powerless against the Puritan, and have no protection except from machine fire.

ARMOR.

In thickness of turret, deck, and bow armor the Puritan is superior to both the other ships, whilst amidships and aft it is inferior, it being considered that this sacrifice is more than compensated by the gain in power of armament, especially since the machinery and steering-gear are fully protected by the heavy backing and coal.

The information available with regard to cost of the three ships is too meager to admit of a detailed comparison, but, in the opinion of the Board, the amount estimated for the completion of the Puritan is in no way excessive, and compares favorably with estimates of the cost of other foreign armored vessels of corresponding size.

Very respectfully, your obedient servant,

R. W. SHUFELDT,

Commodore, United States Navy, President of the Board.

Hon. W. E. CHANDLER,
Secretary of the Navy.

[Inclosure C. Naval Advisory Board, October 25, 1883.]

UNITED STATES NAVAL ADVISORY BOARD,
NAVY DEPARTMENT,
Washington, D. C., April 5, 1883.

SIR: In obedience to the directions contained in your order of the 10th ultimo, regarding the machinery of the United States double-turreted monitors, we have to report:

That we have carefully examined the plans and specifications submitted to this Board by the Bureau of Steam Engineering for the machinery of the Puritan, and we are of the opinion that the general plans and dimensions of the engines and boilers are sufficient to insure the power required, and the weights of the same are not excessive, and that with the following amendments the specifications are such as we advise to be prepared for the building and erection on board the vessel of these engines, together with the boilers already completed, viz:

U. S. IRON-CLAD PURITAN.

That the low-pressure cylinders be fitted with separate expansion valves.

That the journals of both crank-shafts and crank-pin be increased in length. That the reversing arrangement consist of a pair of small cylinders operating a worm-wheel in connection with the links in lieu of the single large cylinder.

That the air and circulating pumps be combined in accordance with the arrangement proposed in the accompanying plans.

That all the stay-tubes be removed from the present boilers, and thick tubes used in their place.

That the steam-drums be omitted from the present arrangement of boilers.

That the boiler compartment be made an absolutely closed fire-room, and the combustion forced by means of revolving blowers, capable of maintaining not less than one inch of water pressure.

That the grates be fitted for the use of bituminous coals.

That there be included in the engine contract the three large steam-pumps, with all their valves, pipes, &c., connecting with the various compartments.

We are also of the opinion that the design of engine submitted by the Bureau of Steam Engineering for the Terror, Amphitrite, and Monadnock be adhered to, with the following amendments, which, although not absolutely essential, we are of the opinion will add to the efficiency of the machinery:

U. S. S. TERROR, AND CLASS.

It is desirable that the working platform be removed to the lower engine-room floor; it will allow the main working parts to be more accessible, and remove the necessity of the attendants constantly remaining in the hottest part of the engine compartment.

That the air and circulating pumps be combined according to the plans accompanying this, and if possible that there be two separate condensers, each with its own pumps.

That all stay-tubes be removed from the boilers, and the ordinary thick tubes substituted.

That the steam-drums be omitted from the spandrels of the boilers.

That the boiler compartment be made absolutely closed, and blowers fitted of sufficient capacity to maintain an air pressure equivalent to not less than one inch of water.

That the grates be designed for the use of bituminous coal.

That there be included in the engine contract the three large steam-pumps, with all their pipes, valves, &c., connecting with the various compartments.

We have, therefore, to recommend that the Bureau of Steam Engineering be authorized to prepare and print specifications embracing all the necessary work to complete the machinery of all these vessels ready for sea, with all details, as follows, viz:

That the contract for the engines embrace every detail connected therewith and all attachments thereto, with adjustable bladed steel screws, and also their connections to the present boilers and all their dependencies, as steam pumps (two) for engine-room and (two) for fire-room; for distillers and pump, ash hoister, steam pumps (three) for compartments, blowers, turning engines for screw shafts, separate condenser for all small engines and circulating pump therefor, all pump strainers, tinning of steam pipes, &c., ventilators, spare machinery, lagging and felt instruments, speaking tubes, and engine signal indicators, drip-pans, oil-tanks, and storerooms complete, steam-launch machinery, stores, painting, patent fees, and working drawings; in fact, that there be no extra bills, and any omission in the specifications of parts necessary to make the machinery complete will be fulfilled by the contractor without claim for additional compensation, and to be furnished this Board, with an estimate of the cost for each vessel, for final examination, as required by the act of Congress approved March 3, 1883, making appropriations for the naval service for the fiscal year ending June 30, 1884.

Very respectfully,

R. W. SHUFELDT,

Rear-Admiral, United States Navy, President of Board.

HENRY STEERS,

Naval Architect, Member.

MIERS CORYELL,

Marine Engineer, Member.

ALEXANDER HENDERSON,

Chief Engineer, United States Navy, Member.

J. A. HOWELL,

Commander, United States Navy, Member.

EDWARD W. VERY,

Lieutenant, United States Navy, Member.

F. L. FERNALD,

Naval Constructor, United States Navy, Member.

Hon. WILLIAM E. CHANDLER,

Secretary of the Navy.

[Inclosure D. Naval Advisory Board, October 25, 1883.]

NAVAL ADVISORY BOARD,

Washington, May 31, 1883.

SIR: Pursuant to our letter of the 17th instant, and after compliance with your verbal directions to consult with the Bureau of Steam Engineering as to the cost of completing the engines and machinery of

the double-turreted iron-clads, the Board respectfully reports the following estimates over and above the sums paid or to be paid to prepare the vessels for launching, and which we consider fair and reasonable compensation for completion of said machinery.

The amounts estimated for as hull-fittings chargeable to construction and repair are for compartment pumps, suction, valves, &c., and turret blowers and duct connecting to fire-room, and for engine and shaft, keelsons, &c.

Name.	Engines, &c.	Hull-fittings.	Total.
Puritan	\$363,495 56	\$45,123 44	\$408,619 00
Terror	175,540 00	33,172 32	208,712 32
Amphitrite	175,540 00	33,172 32	208,712 32
Monadnock	180,834 50	35,172 32	216,006 82
Total.....	895,410 06	146,640 40	1,042,050 46

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, United States Navy, President of Board.

HENRY STEERS,
Naval Architect, Member.

MIERS CORYELL,
Marine Engineer, Member.

ALEXANDER HENDERSON,
Chief Engineer, United States Navy, Member.

J. A. HOWELL,
Commander, United States Navy, Member.

EDWARD W. VERY,
Lieutenant, United States Navy, Member.

F. L. FERNALD,
Naval Constructor, United States Navy, Member.

Hon. W. E. CHANDLER,
Secretary of the Navy.

NAVAL ADVISORY BOARD,
Washington, June 1, 1883.

SIR: The Board respectfully states that a communication has been received from the Bureau of Steam Engineering, stating that a sum included in the Board's estimates for the Puritan, of the 31st ultimo, for erecting the boilers, &c., under the original contract is \$7,786.55 instead of \$6,195.56 as first reported to this Board; therefore, the Board requests that \$1,590.99 be added to the Board's estimates for the machinery of the Puritan, of yesterday's date.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, United States Navy,
President Naval Advisory Board.

Hon. W. E. CHANDLER,
Secretary of the Navy.

[Inclosure E. Naval Advisory Board, October 25, 1883.]

NAVAL ADVISORY BOARD,
Washington, June 15, 1883.

SIR: The Board respectfully acknowledge the receipt of the Department's letter of yesterday's date inclosing the proposed contracts for the completion of the engines and machinery of the double-turreted iron-clads Puritan, Terror, and Amphitrite. We find the specifications and requirements of the machinery in accordance with our report of the 5th April, 1883, and the terms of the contract in accordance with the estimates prepared by this Board and forwarded to the Department on 31st May, 1883; therefore the Board approves the terms of the contracts and considers them to the best advantage of the Government, fair and reasonable, according to the lowest market price for similar work.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, United States Navy, President of Board.

Hon. W. E. CHANDLER,
Secretary of the Navy.

NAVY DEPARTMENT,
Washington, June 6, 1883.

The Department is prepared to contract with you to build the engines and machinery for the double-turreted iron-clad * * * in accordance with the act of Congress of March 3, 1883, and to pay you for building and erecting them on board the vessel completely ready for sea service in all respects, in accordance with the plans, specifications, and contract now prepared in the Bureau of Steam Engineering, the sum of \$——.

Very respectfully,

WM. E. CHANDLER,
Secretary of the Navy.

The foregoing letter was addressed to John Roach, for the Puritan, \$410,209.99; to the Harlan and Hollingsworth Company, for the Amphitrite, \$208,712.32; to The William Cramp & Sons' Ship and Engine Building Company, for the Terror, \$208,712.32.

(Copy of acceptance of each of foregoing parties annexed herewith.)

MORGAN IRON WORKS,
New York, June 7, 1883.

SIR: I am in receipt of your letter of 6th instant, advising me that the Department is prepared to contract with me to build the engines and machinery for the double-turreted iron-clad Puritan in accordance with the act of Congress of March 3, 1883, and to pay for building and erecting them on board the vessel completely ready for sea service in all respects, in accordance with the plans, specifications, and contract now prepared in the Bureau of Steam Engineering, the sum of \$410,209.99. Although the price named is a considerable reduction from the amount in former contract, still, owing to the depressed condition of mechanical interests generally and the low price of material,

I accept the above sum and will examine and execute the contract. I seriously doubt, had materials advanced instead of declining, if the Department would have increased the amount of original contract.

Yours, very respectfully,

JOHN ROACH.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

THE HARLAN AND HOLLINGSWORTH COMPANY,
Wilmington, Del., June 7, 1883.

DEAR SIR: We are in receipt of your favor of yesterday, advising us that you were willing to enter into a contract with us to build the engines and machinery for the double-turreted iron-clad Amphitrite for the sum of \$208,712.32, and that the papers were ready in the Bureau of Steam Engineering. In reply to this, have to say that we have decided to accept your offer, and will take an early opportunity to examine the papers in question and sign the contract.

Very respectfully,

J. TAYLOR GAUSE,
President.

Hon. WM. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

THE WILLIAM CRAMP & SON'S
SHIP AND ENGINE BUILDING COMPANY,
Philadelphia, June 9, 1883.

DEAR SIR: Your offer of June 6th, of \$208,712.32 to build the engines and machinery for the double-turreted iron-clad Terror, is accepted.

Yours truly,

THE WM. CRAMP & SONS' SHIP AND BUILDING COMPANY,
CHAS. H. CRAMP,
President.

Hon. WM. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

ADDITIONAL CRUISERS.

NAVAL ADVISORY BOARD,
Washington, October 25, 1883.

SIR: In response to your verbal request for an expression of opinion by this Board with regard to the types and number of vessels which should be commenced at once, in order to carry forward the work of reconstruction of the unarmored fleet, we have the honor to submit the following remarks and approximate estimates for your consideration:

The rapid deterioration of the vessels composing the present fleet makes it necessary that the work of reconstruction should be carried forward constantly and as rapidly as the demands of proper economy in expenditure will permit, in order that, as the old ships are condemned and withdrawn from service, new ones may be available with which to replace them. In undertaking this work of a complete reconstruction of the fleet, every type and size of vessel which it is proposed to introduce should be carefully studied and decided upon in order that the general result may represent the highest development of efficiency and compactness. To secure these results the types and gradations in size should be few in number and distinct from each other, and whilst each vessel should possess qualities rendering her adaptable to a wide range of service both in peace and war, the gradations should be such as to develop some one of the main requirements to its fullest extent, so that the fleet may be prepared to deal thoroughly with every exigence of naval service.

It is considered that in the commencement of this reconstruction at least one of the vessels of each final type and size should be designed and built, in order that as the work progresses an equal amount of improvement due to work and experience may be realized in all.

There are now in course of construction three of the distinct types and sizes of steel unarmored cruisers of which the fleet will be entirely composed. Of these the Chicago is a representative of the fully equipped cruising fighting vessel, with qualities of speed, endurance, battery power, and handiness carried to the maximum of development permissible without gaining in one at the expense of the other. Her size is at the limit which is considered the test for the full attainments of these qualities, due consideration being given to the question of economy in construction and maintenance. The vessels of this type will replace those of the Wabash, Tennessee, and Trenton types in the old fleet, gaining greatly in power, efficiency, and compactness by the improvements and consolidation. The experience gained in the completion of the design of the Chicago, and the necessity for the early acquirement of more vessels of this description, have led the Board to recommend the immediate construction of one ship of this class and type.

The following is the probable cost of construction and outfit:

Hull	\$650, 000
Machinery	350, 000
Ordnance	225, 000
Equipment	70, 000
Total	1, 295, 000

Although the Chicago represents the maximum of unarmored fighting efficiency, her cost of construction and maintenance limit the number which can be built and the general active cruising capacity. For this reason the Boston and Atlanta were designed, which, by an alteration

in the type, made necessary by the restrictions in the dimensions, maintain a combination of fighting and cruising qualities approximating closely to those of the Chicago at a much reduced cost. This type of ships replaces the two types of the old fleet represented by the Hartford and Omaha, whose service records give the best possible evidence of the great efficiency and absolute necessity of this size of vessels in an unarmored fleet.

We recommend that one more vessel of this type be commenced at once, the following being the estimates of the probable cost of construction and outfit:

Hull.....	\$450, 000
Machinery	260, 000
Ordnance	168, 000
Equipment	58, 000
Total	936, 000

The Dolphin has no counterpart in the constitution of the old fleet, in consequence of which much misunderstanding exists with regard to her value. Her type is considered a very necessary auxiliary to the naval fighting force for duties requiring lightness and speed, which could not be performed economically by vessels composing the main body of the fleet. Of even greater importance, however, is the fact that this vessel serves as a basis from which to develop the pure type of lightly-armed, high-speed, economically-maintained commerce destroyers. As this ship will stand when completed she will be very effective in this respect, although her normal fleet-service is of a different nature. The especial features developed in this vessel, and the requirements of the fleet brought about by the length and position of our coast lines, lead the Board to recommend that a second vessel of this type and size be commenced at once, the following being the estimates of the cost of construction and outfit:

Hull.....	\$232, 000
Machinery	175, 000
Ordnance	50, 000
Equipment	25, 000
Total	482, 000

In the Dolphin actual working and fighting qualities are sacrificed in order to obtain fully the maximum speed and endurance consistent with her size. It is considered that for the proper and economical performance of the multifarious duties of general cruising, survey, exploration, &c., in time of peace, and convoy, blockade, and squadron cruising in time of war, a different type of vessel of the same size as the Dolphin should be introduced. These vessels would replace those of the Juniata, Wachusett, and Essex types in the old fleet, gaining by the perfection of their design greatly increased efficiency for the general work required, whilst similarity of type throughout the class would render them cheaper in general maintenance and more compact and effective for combined work.

The Board recommends that steps be taken to design and construct at once two vessels of this type. The following will be the probable cost of each:

Hull.....	\$216, 000
Machinery	175, 000
Ordnance	100, 000
Equipment	25, 000
Total	516, 000

It is the opinion of the Board that no fleet can be thoroughly efficient that does not possess a number of vessels suitable for navigating shallow waters, that is to say, whose maximum draught of water is not over 9 feet. At the same time these vessels must be sea-going craft, since an important part of their work would be performed in foreign waters.

Like the larger vessels, these gun-boats must possess good fighting and working power. To obtain these qualities it is considered that the greatest size compatible with a draught of 9 feet of water and good sea-going ability is about 750 tons.

The Board recommend that steps be taken to provide for the immediate construction of two of these vessels, the following being the estimates of the cost of construction and outfit of each :

Hull.....	\$132,000
Machinery.....	77,000
Ordnance.....	40,000
Equipment.....	20,000
Total.....	269,000

Owing to the complete isolation of the Pacific coast from that of the eastern side of the United States, it is evident that for complete and efficient working the fleet must be separated into two distinct divisions, and facilities for construction, maintenance, and repair on the Pacific side should be sufficient to render vessels operating on that coast and in Asiatic waters quite independent of Eastern yards.

In order that ship and engine building may be cultivated on that coast and that sufficient inducements may be held out to people to establish factories, it is strongly recommended that, if possible, the vessel of the Dolphin type and one of the gun-boats recommended should be built and fitted out on that side.

The following is the summary of the recommendations of the Board for immediate construction :

Type.	Displacement.	Number to be built.	Total cost.
	<i>Tons.</i>		
Chicago.....	4,500	1	\$1,295,000
Boston.....	3,000	1	936,000
Dolphin.....	1,500	1	482,000
Heavy-armed cruising gun-boat.....	1,500	2	1,032,000
Light-draught gun-boat.....	750	2	538,000
Total.....	13,500	7	4,283,000

In concluding the report the Board deems it necessary to record its emphatic disapproval of the suggestions that have of late been so frequently made throughout the country, that the Navy should acquire a number of extremely high-speed commerce-destroying vessels of great endurance, designed in these respects with special reference to gaining superiority over the large and swift transatlantic mail steamers. The main reasons for this disapproval are as follows :

In order that a competitive vessel should excel in speed and endurance the best of these fast packets, she must certainly cost as much to build and be of nearly as great dimensions, necessitating a displacement of at least 11,000 tons. Once built, these vessels would be so costly in maintenance, so limited in maneuvering power and scope of effective service, owing to the great dimensions, especially the draught, and they would absorb for their control such a large proportion of the

personnel of the Navy, that active service could only be warranted by the most urgent necessity for special work. Such a necessity would under no conditions arise in time of peace, which is the normal state of the nation. To warrant them, then, their special service in time of war must be one certain to occur, and one that could not be performed by other vessels. Now these extremely high-speed packets make up far less than the one-hundredth part of the ocean-steamer tonnage of the world, either in number or value. Even if this hundredth part were considered of sufficient importance for the special consideration, it is absurd to suppose that such valuable material would, in time of war, maintain their ordinary commercial methods and lines of travel. The ease with which they could secure immunity by transfer to a neutral flag, the security which could, and undoubtedly would, be furnished through convoy or an entire suspension of service or alteration of traffic, are considered to furnish the best grounds possible for leaving them out of account in laying down the elements of fleet-construction.

The vulnerable commerce of the enemy, and the one which, if struck, will cause the greatest disaster, is the great bulk of the slow or moderate speed steamers; vessels with which ships of the Dolphin class are thoroughly competent to deal under any or all circumstances. Such being assuredly the case, it seems conclusive that since for the cost of one of these immense vessels eight of the Dolphin class could easily be built and kept at sea, no plausible reason exists for the introduction of the type into the service. The cost of building and fitting out one of these very large vessels would be at least as great as that of all seven of the ships we have recommended.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, United States Navy, President of the Board.

HENRY STEERS,
Naval Architect, Member.

MIERS CORYELL,
Marine Engineer, Member.

ALEX. HENDERSON,
Chief Engineer, United States Navy, Member.

J. A. HOWELL,
Commander, United States Navy, Member.

EDWARD W. VERY,
Lieutenant, United States Navy, Member.

F. L. FERNALD,
Naval Constructor, United States Navy, Member.

Hon. W. E. CHANDLER,
Secretary of the Navy.

ESTIMATE OF THE REQUIRED STRENGTH OF AN UNARMORED CRUISING FLEET.

[Extract from the report of the First Advisory Board, November 7, 1881.]

THE NUMBER OF UNARMORED VESSELS NOW TO BE BUILT.

The first step taken by the Board, in its determination of the number of vessels that should now be built, was to thoroughly investigate the present condition of the fleet; the number of vessels in service in the squadrons; the number of vessels in reserve available for relief; the

estimated life-time of the vessels; the cost of putting them in condition for active service, and their comparative efficiency as measured by their speed, armament, size, &c.

In this manner a knowledge of the number of vessels now available was obtained, and it was found that of 61 unarmored cruising vessels now on the Navy list (torpedo vessels, dispatch vessels, tugs, and sailing vessels excluded) but 32 either are available, or can be made so at a cost low enough to warrant the expenditure. Of these 32 vessels, 24 are at present in commission in the squadrons, leaving a reserve of 8 for the relief of ships requiring repair, &c., or 25 per centum of the whole number, while throughout the world it is recognized that, in order to keep up the strength of a wooden fleet, a reserve of 50 per centum is necessary.

It is the opinion of the Board that, taking into proper consideration the various requirements of the different squadrons for surveying, deep-sea sounding, the protection and advancement of American commerce, exploration, the protection of American life and property endangered by wars between foreign countries, and service in support of American policy in matters where foreign governments are concerned, 43 unarmored cruising vessels are required constantly in commission, or 12 more than are possibly available now in case of the most urgent necessity both in commission and in reserve. Increasing this number by 50 per centum, in order to obtain a reserve of sufficient strength to maintain the effectiveness of the fleet, a total of 65 vessels is obtained, which would be sufficient, were it not for the fact that the present condition and limited life time of some of the vessels included will soon weaken the number very materially. To allow for this loss, it is the opinion of the Board that 5 more vessels should be added, giving a total number necessary to perform efficiently the work of the Navy at present of 70 vessels.

Taking from this the 32 vessels now available, the Board is of the opinion that 38 unarmored cruising vessels should now be built.

THE CLASS, SIZE, AND DISPLACEMENT.

In determining the class, size, and displacement of the unarmored vessels to be recommended, the Board is of the opinion that the first quality necessary to be developed, in order that a vessel shall be thoroughly efficient, is the capability of maintaining a high rate of speed at sea for a protracted period.

The Board decided that, in estimating the proper speed allowance for vessels, what is commonly known as maximum speed, or speed in smooth water on the measured mile, should not be considered, as such a basis is a deceptive one; but that the speed recommended should be the *average speed at sea* that the vessel would be capable of making under full power.

In order that a high rate of speed may be maintained at sea, a great weight of machinery is necessary, and also a great amount of space in the holds of the vessel. These demands alone place a limit upon the minimum displacement of the ship; while, on the other hand, the necessity of keeping within bounds in the draught of water of the ship, and of restricting the length and other measurements to limits that will permit a proper amount of handiness in maneuvering power, places a limit upon the maximum displacement, and consequently upon the speed.

It is the opinion of the Board that the maximum sea-speed that can be recommended as the measure of the size of the largest class of vessels is fifteen knots per hour.

Since the necessities of the service demand a class of vessels that should not draw over nine and one-half feet of water, and since a sea-speed of ten knots per hour is the greatest that can be depended upon with this draught (other qualities being given due weight), it is the opinion of the Board that ten knots should be recommended as the minimum sea-speed in measuring the sizes of vessels.

The Board is of the opinion that classes of vessels represented by sea-speeds of thirteen and fourteen knots are very useful in time of peace and of the greatest possible value in time of war, and that such vessels should now be built.

The sizes of the wooden vessels now in service and available correspond to sea-speeds of eleven and twelve knots. These speeds are not considered by the Board as efficient ones for war service; nor are these vessels capable of maintaining it as a rule. Still, the classes which they represent are excellent for ordinary service-work, and are more fully represented in foreign navies than the higher ones. (See tabulated statement of foreign unarmored vessels appended, p. 108.)

It is the opinion of the Board that the classes should be perpetuated by replacing these vessels as they wear out with modern vessels that shall be fully equal to the speed requirements. There is now, however, a sufficient number of vessels of these classes available for the duty required of them, and the Board does not recommend the building of any more at present.

The Board is of the opinion that the interests of efficiency and economy will best be satisfied in recommending that, of the 38 unarmored cruisers to be built, 2 should be 15-knot vessels of about 5,873 tons displacement; 6 should be 14-knot vessels of about 4,560 tons displacement; 10 should be 13-knot vessels of about 3,042 tons displacement; 20 should be 10-knot vessels of about 793 tons displacement.

Memorandum of the Naval Advisory Board.

NAVAL ADVISORY BOARD,
Washington, November 21, 1882.

SIR: The Naval Advisory Board recommends to the honorable the Secretary of the Navy that there be constructed, in addition to the two cruisers already authorized to be built, two of the ten second-rate, single-decked, steel, unarmored cruisers recommended by the late Naval Advisory Board, the displacement being limited, however, to about 2,500 tons each, with a speed of not less than 13 knots, and at a cost each—

To construction.....	\$425,000
To engines.....	285,000
To ordnance.....	164,825
To equipment.....	50,000
Total.....	924,825

The battery to consist of eight 6-inch breech-loading rifled guns and six revolving guns.

We might also recommend for construction one ram, of the five steel rams suggested by the late Naval Advisory Board, the displacement to be about 2,000 tons with a sea speed of 13 knots, at a cost each—

To construction.....	\$350,000
To engines (twin-screw).....	300,000
To equipment.....	20,000
To torpedo outfit (if fitted).....	51,000
Total.....	721,000

The Board is, however, of the opinion that the construction of a ram is not indispensably necessary, except under prospect of war. The ram is of no use in time of peace, and can be built within ninety days, or readily improvised from another vessel in emergency.

The Board advises that a ram should be designed to provide against the contingency above referred to.

Also one dispatch boat, of about 1,500 tons displacement, to be built of iron, with double bottom, with speed of not less than 15 knots, at a cost—

To construction	\$230,000
To engines	175,009
To ordnance	30,000
To equipment	25,000
Total	460,000

To be armed with one 6-inch breech-loading rifled and four Hotchkiss guns.

The Board, however, suggests that in place of calling this vessel a "dispatch boat" she should be designated a "clipper."

The Board is of the opinion that the construction of a torpedo and gun boat, with a displacement of 450 tons and a speed of 13 knots, as recommended by the late Naval Advisory Board, is not practicable.

The Board would advise the purchase of one "cruising torpedo boat" 100 feet long, with a maximum speed of 21 knots, at a cost of \$38,000, and in place of the torpedo gun-boat, the "dispatch boat" or "clipper" be duplicated, as this is considered a most useful type in war or peace.

Very respectfully, your obedient servant,

R. W. SHUFELDT,

Commodore, United States Navy, President of the Board.

Hon. W. E. CHANDLER,

Secretary of the Navy.

NAVAL ADVISORY BOARD,
Washington, December 20, 1882.

SIR: The Naval Advisory Board respectfully recommends the building of one steaming cruising vessel of steel, about four thousand tons displacement, not to be cased with wood, and of two-thirds full sail power; to be armed with four 8-inch breech-loading rifles, and ten 6-inch breech-loading rifles, with machine guns.

ESTIMATES.

Load displacement	tons..	4,250
Cost:		
To hull		\$828,000
To machinery		448,000
To ordnance		224,854
To equipment		76,000
Total		1,576,854

The Board also recommends the building of three single-deck steel cruisers, of about 2,500 tons displacement, not to be cased with wood, of two-thirds full sail power; to be armed with two 8-inch breech-loading rifles, and nine 6-inch breech-loading rifles, and machine guns.

ESTIMATES.

Load displacement	tons..	2,750
Cost:		
To hull		\$507,000
To machinery		297,500
To ordnance		168,725
To equipment		58,000
Total for each		1,031,225
Total for three		3,093,675

Also one dispatch vessel or "clipper,"* to have a sea speed of fifteen knots, to be built of iron, and be armed with one 6-inch breech-loading rifle and four revolving guns.

ESTIMATES.

Load displacement	tons..	1,500
Cost:		
To hull		\$230,000
To machinery		175,000
To ordnance		30,000
To equipment		25,000
Total		460,000
Also one cruising torpedo boat, 100 feet long, at a cost of		38,000
Total amount estimated for		5,168,529

Very respectfully, your obedient servant,

R. W. SHUFELDT,
Commodore, United States Navy,
President of the Board.

Hon. W. E. CHANDLER,
Secretary of the Navy.

RAMS.

[From the report of the First Advisory Board, November 7, 1883.]

It is the opinion of the Board that one of the pressing necessities of the present time is to provide as far as possible for an efficient naval defense for the coasts and harbors of the country in case of a sudden emergency. Since it was decided that iron-clads must be left out of consideration it became necessary to determine upon auxiliary means of defense, which, although not so far-reaching in their protection, should still hold foreign armored fleets in check until armored defense could be provided.

It is the opinion of the Board that a type of fast and handy marine rams would be especially valuable for such auxiliary defense. In determining the details of such a type, however, the Board was obliged to act entirely upon its judgment with regard to the possibilities, since experience with this type of vessels is entirely lacking throughout the world. But two actual types of such vessels are available on which to base a judgment. The first, a type designed by Rear-Admiral Ammen, U. S. N., whose correctness of details has never as yet been

* Two of these vessels are desirable.

actual construction; and the second, designs of the British ram Polyphemus, now afloat, and whose main principles correspond with those of the American ram.

After mature consideration, the Board is of the opinion that five rams of the general design proposed by Rear-Admiral Ammen should now be built; that these rams should be of about two thousand tons displacement, and that they should be constructed of steel.

It is the opinion of the Board that the cost of any single vessel of this description would be, when complete and ready for service, \$500,000.

TORPEDO BOATS.

[From the report of the First Advisory Board, November 7, 1883.]

It is the opinion of the Board that a torpedo service completely organized as regards both *personnel* and *matériel* furnishes the most economical and efficient auxiliary coast defense attainable. Such a service, to be complete, must embrace not only means of protecting channels and harbors, but must extend its scope to the open sea in the immediate vicinity of the coast, so as to effectually prevent the establishment of blockades, the formation or free operation of hostile squadrons at any given point, or sudden attacks by single armored vessels.

* * * * *

For the strict harbor and channel service, the Board is of the opinion that ten steel vessels of the type known as the Herreshoff harbor torpedo boat should now be built; to be about 70 feet long, and to have a maximum speed of not less than 17 knots per hour. The cost of a single one of this type of vessels, complete and ready for service, would be \$25,000.

The Board is of the opinion that these two types of torpedo vessels should be supplemented by ten steel cruising torpedo boats, that may be used as a re-enforcement, either to the rams and torpedo gun-boats or to the harbor boats. These vessels to be about 100 feet long, and to have a maximum speed of not less than 21 knots per hour. The cost of a single vessel of this type, complete and ready for service, would be \$38,000.

COMMUNICATION OF REAR-ADMIRAL DANIEL AMMEN, U. S. N., ON THE SUBJECT OF MARINE RAMS.

WASHINGTON, August 8, 1883.

SIR: The Department has very considerably suggested the propriety and advantage of officers of the Navy expressing their ideas to it in all matters relating to naval efficiency.

After a long period of observation there are few among them who have not arrived at positive conclusions as to maintaining and educating a *personnel*, and as to what a naval force should be, for the security of our cities and coasts, and, as far as our policy demands, for aggressive action in war.

That the material forces of navies have been constantly changing in a marked degree for the past thirty years, the most indifferent observer could not fail to perceive. It is only necessary to look at the pictures of vessels of war during this period to recognize the fact. Every in-

telligent man of middle age knows as well as the student, or as the professional seaman, that the usefulness of sailing vessels for war purposes has passed away, and that the character of naval armament is quite different. In these mutations, by no means ended, professional men may recognize more fully than others what at this time are the true elements of naval education and of naval force, and in what manner they are most economically attained ; as also the probable directions of progression.

Thirty years ago the United States possessed a large number of persons in the merchant marine, many of whom were afterwards found useful and efficient as officers in the naval service during the civil war after a brief instruction in ordnance and naval organization. They had been educated to the use of sails and to the general exigencies of the sea, without which no commanding officer can be entirely efficient on board a vessel of war even where sail-power is unused. The emergencies of a sea life are sudden and are often fatal when knowledge of the sea and training are lacking in the officers.

In our merchant service we have no longer an efficient source of supply of officers and seamen. Our sea-tonnage is almost wholly coasting vessels with a large proportion of steamers. The Government, therefore, will be forced to educate all those whom it might find necessary to employ as officers in the event of war. A certain number of seamen would naturally be attracted from other flags by high pay and bounties, but the welfare and safety of a nation depend naturally on rearing and training those who are necessary to its defense.

Recent legislation has tended to lessen the number of officers and to destroy the hopes and lessen the spirit of the young men who have recently been educated at the Naval Academy and then discharged, as well as of their class-mates who remain in the service. The idea exists that this legislation does not permit advancement, and little hope is entertained that it will be amended. Many of the younger officers having ability will leave the service, and, should a war occur, would hardly be disposed to give up pursuits and occupations into which they had settled for the doubtful tenure and usually indifferent rewards of faithful and honorable service. Laws other than those operative when they entered the Naval Academy have been enacted which turn many young officers out of the service whose ability and character are unquestioned. The country will need their services and those of many others when a war occurs, and which we invite by a total lack of preparation. Were the laws referred to regarded as wholly just, they may well be considered as impolitic and unwise.

Considering the policy of the United States, which is in no degree aggressive, and the extent of inland waters and exposed coasts, and the number of towns and wealthy cities at this time within the power of second and third rate nations, should it be a question of war, the necessity for a coast defense becomes at once a painful and undeniable fact. The present consideration of a probable condition of affairs, and resultants from a war with either Great Britain or with France, will be more profitable to us at this time, however erroneous, than the contemplation of the actual injury wrought, after a war is in progress. This consideration may spare us a portion of the losses and humiliation that will most certainly occur in the event of war, resulting, too, almost wholly from a lack of preparation. A war with any other considerable power would doubtless entail losses from the same causes, a lack of preparation, but we may suppose in a less degree.

In a war with Great Britain we would have to resist the most power-

ful navy afloat, admirable in its discipline and appointments and maintained constantly in these respects ready for war.

Let the citizens of the United States regard these facts seriously, and how far we are able at this time to defend our coasts against this powerful adversary. We would have our towns and cities to protect from destruction through the long range and very heavy rifled guns of the enemy. Our present naval vessels would be wholly inadequate were all of our improved monitors completed that are now partly constructed, were they equals of the best armored vessels, which is not the fact. They would prove a very ineffective auxiliary to the different forts and the earthworks that would be hastily thrown up, which we may fear would prove insufficient from a lack of time for preparation. It takes a yet more considerable time to construct vessels, even marine rams, that could efficiently support fortifications and minor points of defense where no other than floating defenses could be provided.

Whilst the navy of Great Britain could not fail to commit great havoc and destruction, our land forces could speedily possess themselves of British America from Nova Scotia to the shores of the Pacific. Upon the high seas a great many of her merchant marine would be destroyed, but most of all would she suffer through a loss of commercial intercourse with us and some of her colonies, which is now of the utmost importance to her. The interests and the welfare of the two nations, however, are so interwoven that nothing short of national insanity of one or both could bring about a war between them, which, if it should occur, will be unparalleled in the destruction of property, mostly that of our citizens, with small loss of life between the combatants, and that pretty evenly divided. The results of the war would be unsatisfactory and damaging to a degree, and no possible good could come out of it to either party.

A war with France would be a yet more serious affair to us from the fact that it could be maintained indefinitely by her against us at a very inconsiderable cost, and our defense would be not only enormously expensive, but quite unsatisfactory. There would be no adjacent territory for us to invade, as in the case of a war with Great Britain, and there would be little or no merchant marine on the high seas for us to destroy were we provided with any number of fast cruisers. Increased rates of insurance, as compared with neutral flags, would operate to lay up all merchant vessels under the French flag. Our cities, towns, and coasts, imperfectly defended, would be menaced and some of them destroyed, and our attempts at defense would frequently prove abortive and humiliating.

The French could readily establish large intrenched camps on our outlying islands, as at Martha's Vineyard and at such other points as served strategic purposes, and with considerable land forces could menace thousands of miles of our coasts, making it necessary for us to maintain very large bodies of soldiers at such points as the enemy would be most likely to pounce upon.

Whilst we may regard the French popular feeling as not hostile to us, the recent acts of France in Tunis, on the river Congo, on the island of Madagascar, and her present attitude relative to Tonquin, may well assure us that the same action will sooner or later obtain in Central America.

Are we willing that France should establish a protectorate over any part of that region, and if not, where is our material force to gainsay such action? Whilst fast cruisers would serve as a valuable secondary purpose in a war with Great Britain, by destroying her vessels on the

high seas, they would be of very little value in a war with France, or many other powers. The improved monitors, even though we had a number of them, in point of resistance to projectiles, and in speed, would be far inferior to the armored vessels of any respectable adversary, and possess only one advantage—that of comparatively light draught. In short, we have no vessels at this time on which we could rely for the defense of our coasts.

The French armored vessels, aided by smart cruisers, could raid our coasts, driving toward each other, as between the Capes of the Delaware and Hatteras, and having vessels stationed inside of Cape Henry to prevent escape into inland waters. Thus our coasting trade, which is nearly all the sea tonnage we have, would in great part be captured or destroyed.

As an economic measure, as well as in aid of national defense, we should have a ship-canal through Cape Cod, and between Delaware and Chesapeake Bays, and further south, channel ways of fifteen feet in depth from Norfolk to Florida. As is well known, islands fringe almost the entire coast; the amount of labor requisite to effect all of these excavations would be inconsiderable, and the cost of them would be much less than the losses which would occur from not having these interior channels during war, to say nothing of the very considerable advantage derivable therefrom at all times, especially during the winter season, in the transportation of merchandise at far less risk than coastwise.

In the hope of aiding in economically strengthening our feeble Navy, on our return from the Asiatic station in 1868, I turned my attention to the construction of an armored torpedo boat. With the most favorable lines for deflection that I could design, the displacement was found so great as to make the proposed construction not indifferent as a marine ram should a high velocity be attained. The design was in consequence modified, and the consideration of the construction of a marine ram taken up, which should have capability of attaining a high rate of speed, the best lines for the deflection of projectiles, great strength of construction, and rapidity in turning. This work was steadily pursued, and was much aided by suggestions and the active labors of brother officers and other friends. After some years I presented to our late chief naval constructor, John Lenthall, plans and specifications which he kindly revised. His suggestions as to increase in length, a less amount of material in construction, and various other matters, were fully embodied in subsequent drawings and specifications. These were submitted for calculations by Charles R. Roelker, passed assistant engineer United States Navy, and were found to possess remarkable possibilities of a high speed, even when the vessel should be immersed one foot below the line of greatest beam. The drawings and specifications were submitted to the Advisory Board convened by the Secretary of the Navy in 1881, and as you are aware from the report, the construction of five rams on my general design was recommended. A more recent Advisory Board, it is said, has not taken up the discussion of vessels intended for our coast defense, which seems to me, so far as the naval part is concerned, of primary, not to say of vital importance, whilst the cruisers in a war with France, or most other powers, would be of little positive value.

In relation to the supposed qualities of this marine ram, I refer the Department to the discussion of the Washington branch of the Naval Institute, February 27, 1879. In this discussion Lieut. Frederick Collins said:

I mention as the last, though I consider it really the chief element of our coast defense, the marine ram. For an efficient ram the essential qualities are speed, handi

ness, great strength of construction, and a practical invulnerability to shot, to be secured either by heavy armor or by such form as will offer the least surface and most unfavorable angle to the enemy's projectiles. All these are most admirably united in the type proposed by Rear-Admiral Ammen.

Two years later, in February, 1881, a paper was read by William G. Gibbons, esq., president of the Pusey & Jones Shipbuilding Company, on the marine ram, before the same branch of the Naval Institute. He stated that after a careful study of plans and specifications he regarded the vessel proposed by me as the most powerful for the object that he could conceive, fulfilling the conditions of speed, rapidity of turning, invulnerability, and extraordinary strength of construction. It is proper to add that on these two occasions there were no adverse criticisms, nor have there been at any time before the Naval Institute.

The construction of one marine ram at one-eighth of the cost of a first-class armored gun-bearing vessel would, in my belief, soon enable us to put ourselves on quite a different footing towards other powers, and that too at a very small relative cost.

Should this idea prove illusory, which is improbable, supported as it is by a very large number of the ablest officers in our Navy, then, like other large and wealthy nations, we can do no better than to spend very large sums in the construction of gun-bearing armor-plated ships of the type best adapted to an auxiliary defense of our cities, inland waters, and coasts. Cost what they may, in the event of a war, if unprovided with them or with vessels surely able to destroy them, vessel for vessel, we will find that our "economy" has cost us many times more than even the heavy and indeed onerous expense of an armor-plated gun-bearing Navy, which we may hope to dispense with through the construction of rams.

In regarding our coast defense, for a full comprehension of the subject it is necessary to consider that forts and earth-works, with their guns and subaqueous torpedoes, must form certain lines of defense at points of great importance, and that exterior and interior thereto, armored vessels, either bearing guns or marine rams, having only machine guns with small shields of approved construction on the pilot-house, would be a proper and indispensable supplementary or auxiliary defense.

Bearing in mind the great extent of our coast and inland waters, it becomes apparent that guns in forts can reach over only very insignificant areas, and hence the great importance, and indeed necessity, of movable forces readily concentrated until numerically able to assume the aggressive. If we consider this force to be of armored gun-bearing vessels, they must be either superior in point of resistance to projectiles or superior in weight of projectiles, and numerically superior to an enemy to such a degree as to insure a victory, to defend our coast in a satisfactory manner.

If instead of armored gun-bearing vessels we consider marine rams as more satisfactory, it will be for the following reasons: Two or more rams may attack, under favorable conditions, a fleet of twenty or more armored gun-bearing ships without the act being one of temerity, whilst a serious attack upon a fleet by two or three vessels of similar construction to those attacked would be an act of supreme folly, and would end in their destruction; hence to defend our coasts in acting aggressively with armored gun-bearing ships requires numerical or other superiority.

Beyond this lies the fact that six or eight rams can be built at the cost of one armored vessel of the best class, and twenty of them can be maintained at the cost of one armored vessel. The deterioration of

the ram from time and service would be quite insignificant, whilst with armored gun-bearing ships it is very great.

In order to have a satisfactory defense of our coast by the aid of rams, they should, however, be numerically equal at least to the armored ships they attack, and should operate either in pairs or in trios. Thus the destruction of vessels actually attacked would be almost assured, however many torpedo-boats they might lower in their defense. Admitting the destruction of the armored gun-bearing ship, and as well of the three assailing rams, as an ordinary result, the odds would be greatly in our favor, as regards the loss of life and the cost and time necessary to replace the vessels destroyed. No nation could continue this warfare with us, and our coasts and harbor entrances would soon be abandoned by the enemy.

Whilst there are many reasons for believing that marine rams would do their work effectively, with comparatively small loss, yet it is impossible to conceive any effective warfare that does not impose upon the assailants of well-provided and intelligent antagonists the dangers and penalties that belong to war; therefore, it is worth while to regard the question without special favor to the ram. If half a dozen of them go under in the destruction of one armor-plated gun-bearing antagonist of the first-class, the odds or advantages are still largely in favor of their employment, whilst the chances are, should two or three rams act conjointly, or as a unit, they would probably escape destruction, if not injury.

Your earnest consideration of the above may aid in placing us in such a position that we will no longer invite attack through lack of preparation for defense, after which we may well consider the best economy of prosecuting warfare aggressively on the high seas as far as our policy demands it. Should a nation declare war against us, we will have short and few notes for preparation; the demand will be instant and imperative, and we will be obliged to comply or suffer the gravest injuries, if as now we are unprepared to defend our coasts.

Very respectfully, your obedient servant,

DAN'L AMMEN,
Rear-Admiral.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy.

[Indorsements.]

AUGUST 16, 1883.

I have, at the request of Admiral Ammen, read this paper, and indorse what he says upon the question of an increase of naval force. Marine rams are unquestionably a very important adjunct to a naval force, particularly for the defense of our own coast and harbors, but I am not prepared to go to the full length advocated by the admiral without a more critical and thorough examination of the subject than I have yet been able to give.

ED. T. NICHOLS,
Rear-Admiral, United States Navy.

WASHINGTON, August 27, 1883.

I have read attentively the very interesting paper on marine rams and our inadequate coast defense, by Rear-Admiral Daniel Ammen, United States Navy.

I indorse the paper most heartily, and would suggest and recommend

that immediate steps be taken to have constructed at least three of these most formidable vessels, each to have a speed of not less than 16 knots per hour, with rapid turning qualities and powerful deflecting armor.

In addition I would recommend that there be constructed, as a beginning, at least one heavy armor-plated cruising man-of-war.

EARL ENGLISH,
*Commodore, United States Navy,
Chief of Bureau of Equipment and Recruiting.*

NAVY DEPARTMENT,
Washington, October 26, 1883.

The accompanying communication from Rear-Admiral Ammen, recommending and arguing in favor of the construction of one or more marine rams, is referred to the Naval Advisory Board to consider whether or not it is advisable to recommend to Congress such construction.

WM. E. CHANDLER,
Secretary of the Navy.

NAVAL ADVISORY BOARD,
October 31, 1883.

Respectfully returned to the honorable Secretary of the Navy.

The Board fully admits the value of rams in connection with vessels of other types, but thinks thus acting alone they would be weak without heavy guns. The ram then becomes an armored gun-vessel, and to obtain the necessary speed would reach the size of our iron-clads, and the Board still considers ships of the cruiser type more necessary at present.

R. W. SHUFELDT,
*Rear-Admiral, United States Navy,
President Naval Advisory Board.*

No. 4.—PERSONNEL OF THE NAVY.

Table showing number of officers required and available for sea-duty.

I.—OFFICERS REQUIRED FOR A CRUISING FLEET OF 43 VESSELS.

Vessels.	Line-officers.	Medical corps.	Pay corps.	Engineer corps.
Tennessee	9	3	1	6
Powhatan.....	7	2	1	5
Lancaster.....	6	3	1	4
Brooklyn	7	3	1	3
Pensacola.....	9	2	1	3
Hartford.....	9	3	1	4
Richmond	7	3	1	4
Lackawanna.....	7	2	1	5
Vandalia.....	7	2	1	3
Juniata.....	7	2	1	3
Quinnebaug	10	2	1	4
Swatara.....	8	2	1	3
Galena	8	2	1	3
Iroquois	9	2	1	4
Wachusett.....	7	2	1	3
Kearsarge	8	1	1	3
Adams.....	7	2	1	3
Alliance	9	1	1	4
Essex.....	8	1	1	3
Enterprise.....	9	1	1	4
Nipsic	11	1	1	3
Monocacy.....	7	1	1	3
Ranger	10	1	1	4
Yantic.....	8	1	1	3
Additional for five flagships.....	18			
One vessel of 5,873 tons: complement one-fourth more than the Tennessee	11	4	1	7
Three vessels of 4,560 tons: Tennessee's complement.....	27	9	3	18
Five vessels of 3,043 tons: Brooklyn's complement	35	15	5	15
Ten vessels of 793 tons: Yantic's complement.....	80	10	10	30
Total officers required.....	365	83	43	157

II.—OFFICERS AVAILABLE FOR SEA-DUTY.

Proportion available.	Grades.	Number fixed by the act of August 5, 1882.	Number available.
LINE-OFFICERS.			
One-third	Rear-admirals	6	2
One-third	Commodores	10	3
One-third	Captains	45	15
One-half	Commanders	85	43
One-half	Lieutenant-commanders	74	37
One-half	Lieutenants	250	125
All	Lieutenants (junior).....	75	75
All	Ensigns	75	75
	Total.....	620	375
MEDICAL CORPS.			
	Medical directors.....	15	
One-half	Medical inspectors	15	8
One-half	Surgeons	50	25
One-half	Passed assistant surgeons.....	79 } 90	39
All	Assistant surgeons.....	11 }	11
	Total.....	170	83

II.—OFFICERS AVAILABLE FOR SEA-DUTY—Continued.

Proportion available.	Grades.	Number fixed by the act of August 5, 1882.	Number available.
	PAY CORPS.		
	Pay directors.....	13	.....
One-half.....	Pay inspectors.....	13	7
One-half.....	Paymasters.....	40	20
One-half.....	Passed assistant paymasters.....	20	10
All.....	Assistant paymasters.....	10	10
	Total.....	96	47
	ENGINEER CORPS.		
	Chief engineers (captain).....	10	.....
One-half.....	Chief engineers (commander).....	15	8
One-half.....	Chief engineers (lieut.-commander or lieutenant).....	45	22
One-half.....	Passed assistant engineers.....	60	30
All.....	Assistant engineers.....	40	40
	Total.....	170	100

NOTE.—There should be added to the totals in the second table the junior ensigns, and the naval cadets who have passed the four years' course, about 200 in all, who, although not a necessary part of the complement of the fleet, are nevertheless available for sea-duty while they continue in the service. These additions give a total number of officers available for sea-duty sufficient to cover any present demands in excess of the complement of the cruising fleet.

STATUS OF THE PASSED ASSISTANT ENGINEERS.

NAVY DEPARTMENT, BUREAU OF STEAM ENGINEERING,
Washington, November 23, 1883.

SIR: I respectfully beg leave to bring to your notice the unfortunate position occupied by the older passed assistant engineers of the Navy, as regards their pay.

I am well aware that there are officers in other branches of the service who consider themselves similarly aggrieved, but I feel confident that even a casual scrutiny will show that no class of officers can present a case so hard or a future so hopeless as the passed assistant engineers.

Secretary Hunt in his Annual Report of 1881, and also the then engineer-in-chief, called attention to the undeserved position of these officers. (Appendix A.) Nine years ago Medical Inspector Gunnell, in answer to certain inquiries of a Congressional investigating committee, voluntarily stated that in his opinion the passed assistant engineers were the worst paid officers of the service. (Appendix B.) Most of them are now over forty-two years of age, and have been in the naval service over twenty-one years, embracing nearly the whole period of the war of the rebellion. To-day they are the only officers who served through that great conflict who have never enjoyed any of the benefits so liberally bestowed upon other arms of the service, while they are receiving much less pay than officers of similar rank, who actually had not entered the Naval Academy until after these passed assistant engineers had been commissioned in their present grade. Such an anomaly has few parallels.

With old age creeping upon them; with little or no hope of promotion for years to come; and with their contemporaries in other branches

of the service occupying the grades of commander, medical inspector, and pay director, their position would assuredly seem to demand some attention and amelioration, and I most earnestly ask your favorable consideration of their case.

Several attempts have been made to remedy the condition of these officers. The Senate on February 21, 1881, passed a bill looking to their relief, but the measure failed in the House for lack of time. (Appendix C.) On April 4, 1882, Senator Rollins, from the Committee of Naval Affairs, favorably reported a bill giving longevity pay to passed assistant engineers. (Appendix D.) The House Committee on Naval Affairs June 6, 1882, reported favorably a similar measure. (Appendix E.) It is earnestly asked that a remedial measure, embodying what has already been attempted, be recommended to Congress for their favorable consideration. (Appendix F.) If, in view of the conflicting claims of other branches of the service, this should be deemed unadvisable, it is respectfully suggested that a Board might be convened with authority to take into consideration the revision of the pay table of the Navy, for the future action of Congress.

In making this appeal, I would state that I am actuated by no feeling of ill-will or jealousy of any grade or branch of the service with which comparison has been made, but am impelled solely by a desire to ask that justice be done to a long-enduring class of officers, whose claims would certainly seem to deserve some recognition.

In conclusion, I would suggest, with all deference, that if the pay of all officers of the Navy was based upon a system of longevity, length of service would have its reward, and the cause of much bitterness and ill-feeling be removed.

Hoping that you will deem the matter worthy of your attention and consideration, I am,

Very respectfully, your obedient servant,

DAVID JONES,

Passed Assistant Engineer, United States Navy.

Hon. WILLIAM E. CHANDLER,

Secretary of the Navy.

Respectfully forwarded, earnestly commending the subject to the careful attention and favorable consideration of the honorable Secretary of the Navy, and trusting that some early and definite action may be had in relation thereto.

W. H. H. SMITH,
Acting Chief of Bureau.

APPENDIX A.

[Extract from Report of Secretary of the Navy, 1881.]

I desire to call attention to the somewhat anomalous condition in which the grade of passed assistant engineer stands with regard to pay. The officers of this grade, holding in a majority of cases the relative rank of lieutenant, receive at present one increase of pay after a period of five years' service in that grade, and then the pay remains the same no matter how long promotion may be delayed.

It was evidently assumed that none would remain in that grade longer than ten years, whereas the term of service approaches twenty years.

The next higher grade receives four increases of service pay, and it would seem but justice, in view of the slow promotion of the passed assistant engineers, and of the fact that most of them will retire before being benefited by the longevity pay in the higher grade, that their pay should be graduated on the basis of length of service. I earnestly commend their case to your favorable consideration.

[Extract from Report of Engineer-in-Chief, 1881.]

I desire to call the attention of the Department to the somewhat anomalous condition in which the grade of passed assistant engineer stands, with regard to pay. The officers of this grade, holding in a majority of cases the relative rank of lieutenant, receive at present one increase of pay after a period of five years' service in that grade, and then the pay remains the same, no matter how long promotion may be delayed.

It was evidently assumed that none would remain in that grade longer than ten years, whereas the term of service approaches twenty years.

The next higher grade receives four increases of service pay, and it would seem but justice, in view of the slow promotion of the passed assistant engineers, and of the fact that most of them will retire before being benefited by the longevity pay in the higher grade, that their pay should be graduated on the basis of length of service. I earnestly commend their case to your favorable consideration.

APPENDIX B.

[Extract from letter of Medical Director F. M. Gunnell., H. R. Mis. Doc. 170, part 8, page 134.]

The worst paid officers of the Navy are the passed assistant engineers, some of whom, after fourteen or fifteen years of manhood service, including the whole time of the war, are receiving \$1,000 a year less pay than their contemporaries in service, who are commanders, paymasters and surgeons, and with little prospect of promotion. They should certainly have increased pay in proportion to length of service.

APPENDIX C.

Senate bill 1422, introduced by Mr. Booth March 4, 1880; referred to Committee on Naval Affairs; reported by Mr. Farley with amendments May 3, 1880, and passed the Senate February 21, 1881.

APPENDIX D.

Senate bill 625, introduced by Mr. Voorhees December 19, 1881; referred to Committee on Naval Affairs, and reported by Mr. Rollins with an amendment April 4, 1882.

The report was as follows:

REPORT.

[To accompany bill S. 625.]

The Committee on Naval Affairs, to which was referred the bill (S. 625) to amend section 1556 of the Revised Statutes, giving longevity pay to certain officers of the Navy, having had the same under consideration, submits the following report:

The purpose of the bill referred to the committee was to give to the passed assistant surgeons, passed assistant paymasters, and passed assistant engineers of the Navy an increase of pay of \$250 per annum after they had received the pay now provided by law for a period of ten years, and at the expiration of a further period of five years to give them another increase of like amount. The committee, on investigation, finds the following facts:

All the officers who would be affected by this bill have the relative rank of lieutenants by law, but are paid \$400 per annum less than they, while they are subject to the same expenses as to uniforms, messes, &c. The next higher grades of the staff corps to which these officers belong have five grades of pay, increasing with each period of five years' service in those grades. There are now no passed assistant surgeons in the Navy who have been such for ten years, and hence none could now be benefited by the bill; and there are but four passed assistant paymasters who have been such for ten years, all of whom (except one who is undergoing suspension) will be promoted within a few months by retirements. The committee has therefore reported the bill with an amendment, making it include only the passed assistant engineers.

Great injustice seems to have been done to this grade of officers. All of the 45 who would be benefited by the bill entered the Navy during the war, in 1861 and 1862, under regulations of the Navy Department, which provided for their promotion

to the grade of chief engineer after they had seen seven years' sea service in the junior grades; but, as a matter of fact, all of them have already been passed assistant engineers for from fourteen to sixteen years, and by reason of the laws now in force they can only be promoted by the deaths or retirements of chief engineers. Many of them cannot be promoted in less than ten or twelve years from the present time, which will give them an approximate period of twenty-five years' service in the same grade. An examination of the Navy Registers from 1862 to 1882 shows that the officers of the line who entered the active service from the Naval Academy in 1861 and 1862 have long been commanders, and the medical and pay officers of the same dates of entry are medical and pay inspectors or have been surgeons or paymasters for many years, while those engineer officers who entered at the same time are still passed assistant engineers, receiving from one-half to less than two-thirds the pay of their contemporaries of twenty years ago.

The honorable Secretary of the Navy, in his last annual report, earnestly recommends their case to favorable consideration.

During the last session of the Forty-sixth Congress the Committee on Naval Affairs reported a bill giving this same increase of pay to the passed assistant engineers, which was passed by the Senate, but failed to be reached in the House.

The committee therefore reports the bill, as amended, with a favorable recommendation.

APPENDIX E.

House bill No. 1384, referred to Committee on Naval Affairs December 16, 1881. reported with amendments June 6, 1882.

APPENDIX F.

PROPOSED MEASURE.

[To amend section fifteen hundred and fifty-six of the Revised Statutes.]

That the passed assistant engineers of the Navy shall receive during the third five years from which they take rank as passed (first) assistants, when at sea, two thousand four hundred and fifty dollars; on shore duty, two thousand two hundred and fifty dollars; on leave or waiting orders, nineteen hundred dollars; during and after the fourth five years from such date, when at sea, two thousand seven hundred dollars; on shore duty, two thousand three hundred and fifty dollars; on leave or waiting orders, one thousand nine hundred and fifty dollars.

STATUS OF THE JUNIOR ENSIGNS.

BUREAU OF ORDNANCE, NAVY DEPARTMENT,
September 25, 1883.

SIR: I would most respectfully ask your consideration of the present position of graduates of the Naval Academy assigned to the line as compared with the position of those assigned to other corps of the Navy, and that of the graduates of the Military Academy, and I would respectfully submit my own case as an example of the workings of the present law.

I entered the Naval Academy in 1876, and began the course of instruction in a class of 124 cadet-midshipmen and 27 cadet-engineers; completed the four years' course in 1880, with 62 cadet-midshipmen and 18 cadet-engineers; and, after two years' sea service, returned to the Naval Academy, and finally graduated in 1882.

I was then appointed a midshipman, and the title of that grade having been changed by Congress, I am now, more than seven years after entering the Naval Academy, a junior ensign, with the sea pay of

\$1,000 per annum. Moreover, it will in all probability be four years before I reach the rank of ensign, and have a sea pay of \$1,200.

In contrast with this, those of my class who entered the engineer corps, immediately upon graduating, were given the rank of senior ensign and a sea pay of \$1,700 per annum, with an increase to \$1,900 after five years, this latter being greater pay than I can attain to till I have been a junior lieutenant for five years. Moreover, men who were in my class at the Naval Academy, and who failed to graduate, are now, by civil appointment, in the Pay and Marine Corps, in each having the rank of senior ensign, and in the former \$1,700, and in the latter \$1,400 per annum at sea. In further contrast, graduates of the Military Academy of my date have for three years past had the rank of second lieutenant (equivalent to senior ensign) and the pay of \$1,400, with an increase for each five years.

Shortly after my final graduation Congress provided for the union of the cadet-midshipmen and cadet-engineers at the Naval Academy into one body of naval cadets; the successful graduates to be assigned to the line, engineer, and Marine Corps, on the completion of the six years' course.

This change having been effected, I now find myself, in rank and pay, far below men who entered the Naval Academy after I did, and even some who were turned back from my class into the class below. Indeed, it is now possible for men who had not entered the Naval Academy when I graduated to outrank me in the service on their graduation; and this will actually happen unless the present law is modified.

The justice of giving all graduates of the Naval Academy retained in the service the same relative rank must be allowed by all officers of the Navy, whether staff or line, and, indeed, has been formally recognized by Congress in giving to civil appointees to staff corps six years' seniority, corresponding to the six years' course of instruction at the Academy, at the close of which the midshipman was supposed to become an ensign.

The present law is not only unjust to individuals, but works harm to the entire Navy, in that it discriminates against the line, on whose efficiency depends that of the Navy, holding out inducements to the highest graduates of the Naval Academy to enter those corps of the service where their ability will be of the least service to the country.

In view of these facts, it seems but just that those graduates of the Naval Academy who are assigned to the line should be made senior ensigns, and thus put on an equality in rank, if not in pay, with their co-graduates who enter the staff corps. I would, therefore, most respectfully ask that you take some action in this matter to correct the evils of the existing law, and to relieve the junior ensigns from their present anomalous position.

Very respectfully, your obedient servant,

P. R. ALGER,
Junior Ensign, United States Navy.

Hon. W. E. CHANDLER,
Secretary of the Navy.

Respectfully forwarded. Justice and policy both require that the rank and pay of junior officers of the line and staff should be equalized.

MONTGOMERY SICARD,
Chief of Bureau.

STATUS OF THE MATES.

UNITED STATES NAVY-YARD, BOSTON, MASS.,

September 4, 1883.

SIR: We, the undersigned, in behalf of the corps of mates in the United States Navy, respectfully bring before your notice the following facts regarding said corps, and would respectfully ask your valuable assistance, if meeting your approval, to better our condition.

There are now in the United States Navy thirty-eight mates, all of whom, excepting two or three, served in the Navy or Army during the late war.

The pay of mates is now \$900 at sea, \$700 on shore duty, and \$500 on leave or waiting orders. We are not eligible to the retired list; neither do we enjoy the benefits of longevity pay as all other officers of the Navy do. The enlisted men in the Navy also get the benefit of longevity pay, for on each re-enlistment they get an increased monthly pay. Our expenses on shipboard, cost of uniforms and mess-bills, are equal to those of warrant officers, who receive an increase of pay every three years, and who also receive the benefits of retired list. As all the mates in the service of the United States have given the best days of their lives to the service, and have nothing to look forward to in their old age, we lay these facts before you, sir, hoping that you will take such steps in the matter as may seem best to you, to aid us in bettering our condition.

We are, sir, very respectfully, your obedient servants,

JAMES W. BAXTER, *Mate, United States Navy.*

HUGH KUHL, *Mate, United States Navy.*

WM. W. BECK, *Mate, United States Navy.*

JOHN GRIFFIN, *Mate, United States Navy.*

WM. JENNEY, *Mate, United States Navy.*

F. H. POOLE, *Mate, United States Navy.*

J. L. VENNARD, *Mate, United States Navy.*

WALTER N. SMITH, *Mate, United States Navy.*

CHARLES WILSON, *Mate, United States Navy.*

Hon. WM. E. CHANDLER,

Secretary of the Navy, Washington, D. C.

No. 5.—NAVY-YARDS.

MEMORANDA OF THE NAVY-YARD COMMISSION.

UNITED STATES FLAGSHIP NEW HAMPSHIRE,
Newport, R. I., June 6, 1883.

SIR: The Commissioners on Navy-Yards have the honor to submit herewith, agreeably to your request, the following memoranda on the reorganization of the navy-yards, and the disposition proposed to be made of each yard.

Very respectfully, your obedient servant,

S. B. LUCE,
Commodore, United States Navy, President Commission.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

MEMORANDA.

We recommend a reorganization and concentration of the mechanical departments in every navy-yard, so that there shall be but one shop in each for the performance of the same class of work. This involves the following changes: The abolition of all shops doing the usual work of machine shops, all coppersmith, all boiler shops and all foundries except those of steam engineering. Also of all joiner and all paint shops except those of construction.

We also recommend such a concentration of work, that each of the several articles that form a part of the outfit of every ship shall be made in a single shop, to be established in such yard as may have the best facilities and conveniences therefor. Some of the principal articles being boats, blocks, bags, hammocks, tarpaulins, steam-cutter machinery, engine and boiler mountings, gun-carriages and gun-fittings.

We also recommend that whenever there is not, as at present, sufficient work to warrant the expense of maintaining separate shops, all plumbing and iron-plating work be transferred to the coppersmith, machine and boiler shops of Steam Engineering.

We recommend, further, that at each yard a central steam generating establishment be erected, which shall furnish steam for all motive power, and for heating purposes; a great reduction in the cost of fuel and of attendance will unquestionably be secured thereby, as well as greater convenience and efficiency.

MARE ISLAND YARD.

We consider it absolutely necessary that the Mare Island navy-yard be retained in full operation, it being the only workshop of the Government on the Pacific coast, and submit the following table, showing the foremen, &c., now employed and those required if our recommendations are adopted:

YARDS AND DOCKS.

Present organization.	Per diem.	Proposed organization.	Per diem.
General foreman.....		Establish	\$5 00
Superintendent machinery.....	\$5 00	Abolish (steam engineering).	
Quarterman machinist.....	4 50	Abolish (steam engineering).	
Foreman joiner.....	5 00	Abolish (construction).	
Foreman mason	5 00	Retain (while on dry dock)	5 00
Foreman laborer.....	5 00	Retain	4 50
	\$24 50		\$14 50

CONSTRUCTION.

Master carpenter	\$6 00	Retain	\$6 00
Master joiner.....	6 00	Retain	6 00
Master smith	6 00	Retain	6 00
Master spar-maker.....	6 00	Retain	6 00
Master block-maker	6 00	Retain	6 00
Master boat-builder	6 00	Retain	6 00
Master painter	6 00	Retain	6 00
Master calker	6 00	Retain	6 00
Master laborer	4 80	Retain	4 80
Quarterman carpenter	5 76	Retain	5 76
Quarterman carpenter	5 76	Retain	5 76
Leading joiner	4 74	Retain	4 74
Sawyer in charge.....	5 50	Retain	5 50
Foreman iron-plater.....	6 00	Abolish (steam engineering).	
Quarterman iron-plater.....	4 76	Abolish (steam engineering).	
Master plumber	6 00	Abolish (steam engineering).	
Superintendent dry-dock.....	6 00	Retain	6 00
	\$97 32		\$80 56

STEAM ENGINEERING.

Foreman machinist	\$5 75	Retain	\$5 75
Foreman machinist (afloat)	5 75	Retain	5 75
Foreman pattern-maker	5 75	Retain	5 75
Foreman boiler-maker	5 75	Retain	5 75
Foreman molder.....	5 75	Retain	5 75
Foreman coppersmith	5 75	Retain (coppersmith and plumber	5 75
Foreman blacksmith.....	5 75	Abolish (construction).	
	\$40 25		\$34 50

EQUIPMENT AND RECRUITING.

Foreman sailmaker.....	\$4 90	Retain	\$4 90
Quarterman rigger	4 50	Retain	4 50
	\$9 40		\$9 40

ORDNANCE.

Has no foreman at present.

Total daily pay at present \$171 47 Total daily pay proposed..... \$138 96

PENSACOLA YARD.

We advise that the Pensacola yard be closed. Should this be done, the following organization will be sufficient for the preservation of the yard and the property therein:

YARDS AND DOCKS.

General foreman	\$5 00
Quarterman laborer	2 25

CONSTRUCTION.

Quarterman carpenter \$4 25

STEAM ENGINEERING.

Quarterman machinist 4 25

Total daily pay proposed \$15 75

NORFOLK YARD.

We advise that the Norfolk navy-yard be retained in first-class working condition, suggesting, in accordance with our proposition for the concentration of work, the following changes in the personnel of foremen and other superintendents:

YARDS AND DOCKS.

Present organization.		Proposed organization.	
General foreman.		Establish	\$5 00
Foreman mason	\$5 00	Abolish.	
Foreman house-joiner	5 00	Abolish (construction).	
Foreman laborer	4 50	Retain	4 50
Quarterman hod-carrier	3 00	Abolish.	
	\$17 50		\$9 50

CONSTRUCTION.

Master carpenter	\$5 50	Retain	\$5 50
Master joiner	5 00	Retain	5 00
Master smith	5 00	Retain	5 00
Master spar-maker	5 00	Retain	5 00
Master painter	5 00	Retain	5 00
Master laborer	5 00	Retain	5 00
Master calker	5 00	Retain	5 00
Engineer in charge	4 00	Abolish.	
Quarterman ship-keeper	3 00	Retain	3 00
Quarterman joiner	3 76	Retain	3 76
Quarterman laborer	2 26	Retain	2 26
Quarterman laborer	2 26	Retain	2 26
Timber inspector	4 50	Retain	4 50
Master iron-plater	5 00	Abolish (steam engineering).	
Quarterman iron-plater	3 76	Abolish (steam engineering).	
Master plumber	5 00	Abolish (steam engineering).	
Master boat-builder	5 00	Retain, if not at any other yard .	5 00
Master block-maker	5 00	Retain, if not at any other yard .	5 00
	\$79 04		\$61 28

STEAM ENGINEERING.

Superintendent machinery	\$6 50	Retain	\$6 50
Quarterman machinist	3 50	Retain	3 50
Quarterman machinist	3 50	Retain	3 50
Quarterman pattern-maker	3 50	Retain	3 50
Foreman molder	5 00	Retain	5 00
Foreman boiler-maker	5 25	Retain	5 25
Quarterman boiler-maker	3 50	Retain	3 50
Foreman coppersmith.		Estab.(coppersmith and piumber)	5 00
	\$30 75		\$35 75

EQUIPMENT AND RECRUITING.

Foreman sailmaker \$5 00 Retain \$5 00

ORDNANCE.

Has no foreman at present.

Total daily pay at present \$132 29 Total daily pay proposed \$111 53

WASHINGTON YARD.

We advise that the Washington yard be dropped from the list of navy-yards, but, under the designation of naval arsenal, retained in full working condition for the manufacture of specialties under the Bureaus of Equipment and Ordnance; sheet copper under Construction, and standard articles under Steam Engineering. The following changes, in accordance with the above suggestions, in the personnel are submitted:

YARDS AND DOCKS.

Present organization.		Proposed organization.	
General foreman.		Establish	\$5 00
Quartermen joiner.....	\$3 50	Retain	3 50
Quartermen painter.		Establish.....	3 50
Quartermen laborer	3 50	Retain.....	3 50
Special quartermen.....	4 00	Abolish.	
	\$11 00		\$15 50

CONSTRUCTION.

Master carpenter	\$5 00	Abolish.	
Quartermen carpenter	3 76	Abolish.	
Quartermen joiner.....	3 76	Abolish (yards and docks).	
Quartermen painter	3 51	Abolish (yards and docks).	
Quartermen calker	3 51	Abolish.	
Superintendent copper-mills	5 00	Retain	\$5 00
Master laborer	4 00	Abolish.	
Master iron-plater	5 00	Abolish (steam engineering).	
Engineer in charge	4 00	Abolish.	
Quartermen smiths	3 76	Abolish (equipment).	
	\$41 30		\$5 00

STEAM ENGINEERING.

Superintendent machinery.....	\$6 50	Retain	\$6 50
Foreman pattern-maker	5 25	Retain	5 25
Foreman iron foundry	5 25	Retain	5 25
Foreman boiler-maker.....	5 25	Retain	5 25
Foreman machinist (2d class)...	4 50	Abolish.	
	\$26 75		\$22 25

EQUIPMENT.

Foreman sailmaker	\$5 00	Retain (if for special work).....	\$5 00
Foreman smiths	5 00	Retain	\$5 00
Foreman galley-makers.....	6 00	Retain	6 00
Sup't forge and anchor shop.....	5 00	Retain	5 00
	\$21 00		\$21 00

ORDNANCE.

Foreman ordnance.....	\$6 00	Retain	\$6 00
Quartermen ordnance	4 00	Retain	4 00
	\$10 00		\$10 00

Total daily pay at present .. \$110 05

Total daily pay proposed .. \$73 75

LEAGUE ISLAND YARD.

We recommend that League Island yard be closed, both as a yard and as a naval station, until plans have been prepared and approved

for such a yard as the Department requested authority to construct and Congress authorized, and until the filling, the construction of the quay walls, and the gateways to the great ship-basin in the back channel are completed.

The present plans contemplate the construction of exactly what the Department declared it did not want, viz, another similar yard to those it then possessed, whereas the Department demanded authority to build a great iron-shipbuilding and iron-manufacturing yard only. This change of plan necessarily involves the expenditure of an enormous sum of money for improvements that are not required, as they exist in other yards. Such an expenditure cannot therefore be justified.

We consider the site too valuable and desirable to be abandoned, and do not believe that similar or equal accommodations can be procured elsewhere at a lower cost. We believe no better locality than the Delaware River can be found for the purpose for which the site was selected, and therefore recommend the completion of this yard on the original basis; but we are also unanimously of the opinion that it is totally unfit for an ordinary or small yard, and that if the original plan is to be abandoned the island should be also.

PRESENT ORGANIZATION.

YARDS AND DOCKS.

Foreman joiners.....	\$5 00
Foreman laborers.....	4 50
	\$9 50

CONSTRUCTION.

Master carpenter.....	5 50
Master joiner.....	5 00
Master iron-plater.....	5 00
Master plumber.....	5 00
Master painter.....	5 00
Master boat-builder.....	5 00
Master block-maker.....	5 00
Master calker.....	5 00
Master spar-maker.....	5 00
Master laborer.....	4 00
Quartermen shipsmith.....	4 02
Quartermen shipwright.....	4 02
	\$57 54

STEAM ENGINEERING.

Foreman machinists.....	\$5 95
Foreman foundry.....	4 50
	10 45
Total daily pay at present.....	\$77 49

Should it be determined to close this yard the following organization will be required:

YARDS AND DOCKS.

General foreman.....	\$5 00
Quartermen laborers.....	2 30

CONSTRUCTION.

Quartermen carpenter.....	\$3 50
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STEAM ENGINEERING.

Quartermen machinist.....	\$3 50
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Total daily pay proposed.....	\$14 30
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NEW YORK YARD.

We advise that the New York yard be retained as a first-class yard; but that no further expenditures be made thereon, until plans for the full development of the yard shall have been prepared and approved.

These plans should include the improvement of the Wallabout Channel and the utilizing of the cob-dock for the purposes of a wet basin.

We submit a table showing present and proposed list of foremen, &c. In the latter we have omitted those foremen of trades which we are of the opinion should be carried on at one yard only, not for the purpose of indicating that they should not be established here, but simply to make the total amount of proposed pay correct:

YARDS AND DOCKS.

Present organization.		Proposed organization.	
General foreman		Establish	\$5 00
Foreman masons	\$5 00	Abolish.	
Foreman joiners	5 00	Abolish (construction).	
Foreman laborers	4 50	Retain	4 50
Superintendent of teams	4 70	Abolish.	
	\$19 20		\$9 50

CONSTRUCTION.

Master carpenter	\$5 50	Retain	\$5 50
Quartermaster carpenter	4 26	Retain	4 26
Quartermaster carpenter	4 26	Retain	4 26
Superintendent saw-mill	4 00	Retain	4 00
Master joiner	5 00	Retain	5 00
Master smith	5 00	Retain	5 00
Master iron-plater	5 00	Abolish (steam engineering).	
Master spar-maker	5 00	Retain	5 00
Master boat-builder	5 00	Abolish.	
Master painter	5 00	Retain	5 00
Master plumber	5 00	Abolish (steam engineering).	
Engineer in charge	4 00	Retain	4 00
Master laborer	4 00	Retain	4 00
Quartermaster laborer	2 76	Retain	2 76
Master calker	5 00	Retain	5 00
Superintendent oakum-mill	4 00	Retain	4 00
Shipkeeper in charge	3 00	Retain	3 00
Master block-maker	5 00	Abolish.	
	\$80 78		\$60 78

STEAM ENGINEERING.

Foreman machinist	\$5 26	Retain	5 26
Foreman machinist (outside)	5 26	Retain	5 26
Foreman pattern-maker	5 00	Retain	5 00
Foreman boiler-maker	5 26	Retain	5 26
Foreman molder	5 00	Retain	5 00
Foreman coppersmith	5 00	Retain (coppersmith and plumber)	5 00
	\$30 78		\$30 78

EQUIPMENT AND RECRUITING.

Foreman sailmaker	\$5 00	Retain	\$5 00
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ORDNANCE.

Has no foreman at present.

Total daily pay at present ..\$135 76

Total daily pay proposed... \$106 06

NEW LONDON NAVY YARD.

We advise that the New London yard be dropped from the list of navy-yards and naval stations, and the stores and material sent to other yards.

We recommend further that arrangements be made for the transfer of the Naval Asylum to the vacated site on the Thames.

BOSTON AND PORTSMOUTH YARDS.

Some differences of opinion exist in the Commission in regard to the disposition to be made of these yards. All agree that the navy-yard at Portsmouth is indefensible against a serious attack from a fleet of iron-clads armed with modern rifled ordnance, unless new and extensive fortifications should be erected for that purpose, the cost of which would be so enormous as to preclude the consideration of such an expedient. Even then it would be so vulnerable to attack, from a force landed to the eastward of the yard, that it would require for its defense an equal force. As a consequence we recommend that no farther expenditures be made thereon for improvements of any kind.

All agree that it would be difficult to overestimate the importance of the Boston yard in time of war, and that it should be so improved as to utilize the water frontage to its utmost extent and at the earliest moment. No expenditures for fortifications would be required for its defense beyond those demanded for the protection of the city itself. All agree that any proposal to dispose of this magnificent property cannot be too strongly condemned. All agree that the rope-walk should be kept in operation, and that in view of this fact and of the superior quality of the painted canvas goods made at this yard, the sail-making department should be kept in operation for the manufacture of tarpaulins and other similar articles for the entire Navy.

A difference of opinion exists as to the immediate disposition to be made of these yards; two members believe that the yard at Portsmouth should be closed; one member believes that the yard at Boston should be retained in active operation; one member considers it important to keep Portsmouth navy-yard open for the reception and refitting of ships returning from southern stations; and that any repairs needed by wooden ships can be made there as well and as cheaply as at any other yard. But he concurs with the other members of the Commission that its importance and value for ship-building have passed away, and that it must be closed whenever the necessity for the repair of wooden vessels ceases. In case it should be decided that no necessity exists for a yard as a sanitary station, he recommends that it be closed. The same member and another believe that no necessity exists that would justify the use of the Boston yard as a construction and repair yard in time of peace.

The Boston yard will require the following organization of foremen, &c., if kept in working condition:

YARDS AND DOCKS.

Present organization.		Proposed organization.	
General foreman.....		Establish	\$5 00
Foreman mason.....	\$5 00	Abolish.	
Foreman joiner.....	5 00	Abolish (construction).	
Foreman machinist.....	5 00	Abolish (steam engineering).	
Foreman painter.....	5 00	Abolish (construction).	
Foreman laborer.....	4 50	Retain	4 50
	\$24 50		\$9 50

CONSTRUCTION.

Master carpenter.....	\$5 50	Retain	\$5 50
Master joiner.....	5 00	Retain	5 00
Master smith.....	5 00	Retain	5 00
Master iron-plater.....	5 00	Abolish (steam engineering).	
Master spar-maker.....	5 00	Retain	5 00
Master boat-builder.....	5 00	Abolish.	
Master painter.....	5 00	Retain	5 00
Master block-maker.....	5 00	Abolish.	
Master plumber.....	5 00	Abolish (steam engineering).	
Master calker.....	5 00	Retain	5 00
Master molder.....	5 00	Abolish, (steam engineering)	
Master laborer.....	4 00	Retain	4 00
Quarterman carpenter.....	3 76	Retain.....	3 76
Quarterman cooper.....	4 00	Abolish.	
Timber inspector.....	4 50	Retain	4 50
Shipkeeper in charge	3 00	Retain	3 00
	<u>\$74 76</u>		<u>\$45 76</u>

STEAM ENGINEERING.

Foreman machinist.....	\$5 26	Retain	\$5 26
Foreman machinist (outside).....	5 26	Retain	5 26
Foreman pattern-maker.....	5 00	Retain	5 00
Foreman boiler-maker	5 26	Retain	5 26
Foreman blacksmith.....	5 00	Abolish (construction).	
Foreman molder.....	5 00	Retain	5 00
Foreman coppersmith.....	5 00	Retain (coppersmith and plumber).	5 00
	<u>\$35 78</u>		<u>\$30 78</u>

EQUIPMENT.

Foreman sailmaker.....	\$5 00	Retain	\$5 00
Foreman machinist.....	5 00	Abolish (steam engineering).	
Foreman rope-maker.....	5 00	Retain	5 00
Quarterman rope-maker.....	3 76	Retain	3 76
	<u>\$18 76</u>		<u>\$13 76</u>

Total daily pay at present.....\$153 80 Total daily pay proposed.....\$99 80

If this yard is closed, with the exception of the equipment department, the following should be the organization:

YARDS AND DOCKS.

General foreman.....	\$5 00
Foreman laborers	4 50
Quarterman masons.....	3 76
	<u>\$13 26</u>

CONSTRUCTION.

Quarterman carpenter.....	\$3 76
Ship-keeper in charge.....	3 00
	<u>\$6 76</u>

STEAM ENGINEERING.

Quarterman machinist	\$3 76
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EQUIPMENT.

Foreman sailmaker (if tarpaulin, &c., are made here)	\$5 00
Quarterman machinist	3 76
Foreman rope-maker.....	5 00
Quarterman rope-maker.....	3 76
	<u>\$17 52</u>

Total daily pay proposed.....\$40 54

If the Portsmouth yard is retained in working order, the following table will show the changes that should be made:

Present organization.		Proposed organization.
YARDS AND DOCKS.		
General foreman.		Establish \$5 00
Foreman laborers.....	\$4 00	Retain 4 00
Foreman machinist.....	4 00	Abolish (steam engineering).
	\$8 00	\$9 00
CONSTRUCTION.		
Superintendent dry-dock.....	\$4 00	Retain \$4 00
Timber inspector.....	3 50	Retain 3 50
Master carpenter.....	5 50	Retain 5 50
Master calker.....	5 00	Retain 5 00
Master plumber.....	5 00	Abolish (steam engineering).
Master brass-molder.....	5 00	Abolish (steam engineering).
Master boat-builder.....	5 00	Abolish.
Master iron-plater.....	5 00	Abolish (steam engineering).
Master painter.....	5 00	Retain 5 00
Master spar-maker.....	5 00	Retain 5 00
Master joiner.....	5 00	Retain 5 00
Master laborer.....	4 00	Retain 4 00
Master shipkeeper.....	3 00	Retain 3 00
	\$60 00	\$40 00
STEAM ENGINEERING.		
Foreman machinist.....	\$5 26	Retain \$5 26
Foreman machinist (outside).....	5 26	Retain 5 26
Quarterman machinist.....	3 50	Abolish.
Leading machinist.....	3 24	Abolish.
Foreman pattern-maker.....	5 00	Retain 5 00
Foreman boiler-maker.....	5 25	Retain 5 25
Foreman blacksmith.....	5 00	Abolish (construction).
Foreman molder.....	5 00	Retain 5 00
Foreman coppersmith.....	5 00	Retain (coppersmith and plumber). 5 00
Foreman laborer.....	3 00	Abolish.
Quarterman laborer.....	2 50	Abolish.
	\$48 01	\$30 77

Total daily pay at present..... \$112 75 Total daily pay proposed..... \$79 77

Should it be determined to close the yard, the following organization will be required:

YARDS AND DOCKS.	
General foreman	\$5 00
Foreman laborer	4 00
Quarterman masons.....	3 76
	<u>\$12 76</u>
CONSTRUCTION.	
Quarterman carpenter	\$3 76
Shipkeeper	3 00
	<u>\$6 76</u>
STEAM ENGINEERING.	
Quarterman machinist	\$3 76
Total daily pay proposed	<u>\$22 52</u>

The aggregate daily pay of foremen at all the yards is, at present, \$900.85, including those at Pensacola; if the navy-yards at Portsmouth, Boston, Pensacola, and League Island be closed, and the organization of the other yards reduced as proposed, it will be \$523.39, an annual reduction of expenses of \$116,238; with the Portsmouth, Pensacola, and League Island yards closed, \$582.65; and with the Boston, Pensacola, and League Island yards closed, \$580.64.

U. S. FLAGSHIP NEW HAMPSHIRE,
Newport, R. I., October 11, 1883.

SIR: Your letter of March 7, "authorizing and directing" the Commissioners on the sale of the navy-yards to report on certain matters in connection with each yard, has been duly received and carefully considered.

The first inquiry is in relation to each navy-yard, "the sale of which is not recommended," whether it is in our "opinion 'specially' adapted for any specific purpose and whether it should be retained in active operation, or otherwise used?"

It is believed that this question is practically covered by the memorandum submitted to you under date of June 6 last.

In answer to the additional inquiries on this point, contained in your letter of September 26, we recommend that the construction of boats and blocks be confined to the New York navy-yard, and that the engines and boilers of steam launches, engine and boiler mountings, gun-carriages and fittings, anchors, chains, sheet copper, &c., be made exclusively in the manufacturing arsenal at Washington.

These recommendations, however, are not to affect the navy-yard at Mare Island, which should be made complete in every particular, being the only yard on the Pacific coast.

The object of these recommendations, as well as those contained in the memorandum, is to close permanently all duplicate shops, and to consolidate others whenever they have not enough work to justify their being retained in active operation; but not to keep them closed when the amount of work to be performed justifies their reopening, or to disturb the established order which prescribes the duties of the several Bureaus of the Navy Department.

The second inquiry in regard to each yard is,

Whether it is fully equipped and provided with all necessary appliances for the prompt economical execution of such work as may be required, and if not, in what respect it is defective, and what will be required to place it in proper and effective condition for any probable demands in time of war, and the estimated cost of any additional requirements.

When it is considered that the days of wooden ships of war, for the building of which our yards were specially adapted, have passed almost entirely away, it will be readily understood that there are many things to be done, and tools and machinery to be procured, to place them in a condition for building and repairing iron and steel ships; while our docking facilities are notoriously inadequate to the wants of the Navy, even in peace, the necessity for increasing them having been ably and frequently set forth.

But the plans and estimates for such works and for the changes necessary to prepare the yards for iron ship building, or even for repairing them, require careful study and much time, and is therefore a labor which this Commission, is not, with its present duties, able to undertake. But we are fully impressed with the necessity of making the following improvements, viz:

The water front of the Boston yard to be reconstructed and deepened, a wet basin, already half excavated, and additional dry-docks constructed. The Wallabout Channel, at the New York yard, to be closed and converted into a wet basin. The cob-dock to be reconstructed, and enlarged to the greatest extent possible, and utilized for dry-docks; and the navy-yard itself extended to Hudson avenue, in order to secure a proper boundary and the exclusive control of the entrance of the

Wallabout. The navy-yard at Norfolk to be extended to the south by the purchase of the land recently examined and favorably reported on by a special Board, and a wet basin and additional dry-docks constructed; and the further development of the manufacturing arsenal at Washington at an early day.

We therefore recommend that for the proper execution of these suggestions that full plans and estimates for each of the above-mentioned yards be prepared, under the immediate supervision of the Chief of the Bureau of Yards and Docks, and that such plans be submitted to the chiefs of all the Bureaus of the Navy Department, assembled as a board, for their approval before they are finally approved by the Secretary of the Navy. That after the final approval of said plans, no deviation therefrom be permitted, except upon the recommendation of said board and the written order of the Secretary of the Navy; and until such plans have been completed no money be spent on any of the yards for improvements.

We beg leave to renew here the recommendations in regard to League Island contained in the memorandum submitted last June.

A site for a navy-yard was selected on the Delaware, that the Government might have a "proper establishment for the construction of iron vessels, iron armor, and iron work of every description for naval purposes, in the immediate vicinity of the iron and coal region of the more central part of the Union." To carry out these views we recommend that a special board be appointed, at as early a day as practicable, to determine the exact requirements of such a yard, and that plans be prepared under the immediate supervision of the Chief of the Bureau of Yards and Docks, in accordance therewith, and that no further money be expended on League Island until the completion and approval of such plans. We also recommend that after the plans have been fully matured, sufficient appropriations should be obtained to complete this yard at the earliest practicable moment, that the Government may avail itself as soon as possible of the undoubted advantages possessed by this site.

The third query invites an expression of our views as to whether "any improvements can be made in the system of performing work at the navy-yards which will promote efficiency and reduce expenses."

In the memorandum already referred to, an attempt was made in the direction implied by this inquiry. The scheme for the reorganization of the working force of our navy-yards, as contained in that paper, was the best that could be devised under the circumstances; it was a step towards a concentration of forces and economy and dispatch in the method of doing work. It was submitted in the belief that a fair trial would soon develop whatever was impracticable and lead to proper amendment; and that in a short time the new system would adjust itself so as to run smoothly, as it certainly would economically.

To a proper understanding of the subject, it should be stated, that the present wasteful extravagance in employing so great an excess of non-producers, and the inefficient system of doing business which has for years past been steadily increasing in our navy-yards, is but the natural outgrowth of the constitution of the Navy Department itself. There can be no manner of doubt of this. Each navy-yard is made up of a number of separate and comparatively independent establishments, little principalities, as it were, each owing allegiance to its own sovereign, the chief of the Bureau to which it belongs. The heads of departments of a navy-yard have extensive and responsible duties, and a large patronage, and are naturally jealous of the interference of any one but their own chiefs.

Thus each department has been gradually building itself up, so as to be independent of all other departments, and is constantly striving to do all its own work. Each of the principal departments has its own body of artisans, its own machinery, its own steam generators, and its own peculiar method of doing business. As an illustration, we take from official "schedule of wages" (Form 9) of civil engineer's office the following ratings: *Boiler-makers, boiler-makers' helper, calkers, coopers, cabinet-makers, core-makers, ship-joiners, ship-carpenters, machinists, machinists' helpers, molders, oakum-pickers, and pattern-makers*—a little ship-yard in itself.

In this way it has come that some of our yards are filled up with machinery far beyond their actual needs, and it is no exaggeration to say that there is to-day enough machinery of various kinds in either the New York or Boston yard to do the work of its own particular class of the entire Navy during peace. We habitually speak of a private ship-yard as a "plant"; but each of our national ship-yards is a segregation of "plants," each having its own separate organization, and each its own internal regulations. Many illustrations might be given to show how, through the want of concert of action among these several "plants," useless and vexatious delays occur, to say nothing of the waste of time and of public money due to such diffusion.

To make such radical changes as we proposed in our memorandum was no easy task, nor did we expect that they could be effected without considerable friction, not to say opposition; but supposing the changes to be made on the basis laid down by the Commission, it is hardly to be hoped, that under present conditions they will be permanent. For whatever changes may be introduced now, and how beneficial soever they may be, still the same causes remaining in active operation must inevitably produce the same results, and in time restore the system of independent plants, with all its attendant evils. Hence we conclude that to organize our navy-yards on a just and permanent basis, to consolidate their several plants, to introduce thrift in the management and promptness in the methods of doing work, with a proper system of accountability; to secure, in short, in each of our yards unification, method, economy, and dispatch, with an administration of its affairs agreeable to the principles of business as understood in civil life, it is absolutely necessary to begin within the Navy Department itself.

Upon the consummation of so desirable an event, which need not necessarily change the general character of the present organization of the Department, the scheme for consolidation, the proper classification of duties, and the abolition of all unnecessary employés in the navy yards can be carried into effect without difficulty and with the essential element of permanency insured.

All of which is respectfully submitted by your obedient servants,

S. B. LUCE,

Commodore, United States Navy, President of Commission.

CHAS. H. LORING,

Chief Engineer, United States Navy, Member.

A. B. MULLETT,

Member.

Hon. WM. E. CHANDLER,

Secretary of the Navy, Washington, D. C.

NO. 6.—CIVIL EMPLOYÉS AT THE NAVY-YARDS.

Statements showing the number of Navy officers, enlisted men, and marines, and civil employés and workmen, engaged at the several navy-yards on the 16th day of November, 1883, with the compensation paid the employés and workmen on that day, and what work was then in progress on ships of war.

CIRCULAR LETTER TO COMMANDANTS OF NAVY-YARDS.

NAVY DEPARTMENT,
Washington, October 16, 1883.

SIR: You will please furnish, as soon after the 16th of November, 1883, as possible, the information asked for herein, to be made up for that day, viz:

I. List of the commissioned or warranted officers of the Navy and Marine Corps, on shore duty at your station, including receiving ships and tugs and Navy pay offices, giving name and rank, with a memorandum of the duty on which they are severally engaged.

II. Statement of the number of petty officers and enlisted men of the Navy and Marine Corps at the station.

III. List of all the civil employés, including foremen and all persons not ordinary mechanics or workingmen, at the station, given consecutively in order of bureaus, with name, occupation, compensation, and appropriation from which each is paid, and their pay for one day.

IV. Statement of the number of all other persons employed at the station in order of the bureaus, classified, and with the total of the pay-roll for the day in each class.

You will also furnish a concise, specific statement of all the work being performed at the station on or for vessels of war.

In furnishing the above information you will be guided by the inclosed forms.

Very respectfully,

WM. E. CHANDLER,
Secretary of the Navy.

GENERAL SUMMARY.

Navy-yards.	Bureaus.	Commiss- ioned and warrant officers.	Enlisted men and marines.	Employés other than ordinary mechanics and workmen.		All other employés.		Total employés.		Work in progress on ships of war.
				Number.	Pay-roll No- vember 16.	Number.	Pay roll No- vember 16.	Number.	Pay-roll No- vember 16.	
Portsmouth.....	Yards and Docks.....			9	\$28 03	35	\$76 86	44	\$104 89	Repairing Omaha and Marion.
	Equipment and Recruiting.....	.....	.....	4	15 06	31	83 54	35	98 60	
	Navigation.....	.....	.....	1	2 74	1	2 00	2	4 74	
	Ordnance.....	.....	.....	1	3 00	3	6 76	4	9 76	
	Construction and Repair.....	.....	.....	28	114 35	342½	881 11	370½	995 46	
	Steam Engineering.....	.....	.....	10	41 39	65	153 66	75	195 05	
	Provisions and Clothing.....	.....	.....	3	9 45	4	9 76	7	19 21	
	Medicine and Surgery.....	.....	.....	5	5 34	.....	.....	5	5 34	
	Total.....	22	82	61	219 36	481½	1, 213 69	542½	1, 433 05	
Boston.....	Yards and Docks.....			16	52 84	25	51 10	41	103 94	Repairing Shenan- doah.
	Equipment and Recruiting.....	.....	.....	10	41 05	58	157 54	68	198 59	
	Navigation.....	.....	.....	.....	.....	2	4 00	2	4 00	
	Ordnance.....	.....	.....	2	7 52	7	16 54	9	24 06	
	Construction and Repair.....	.....	.....	24	91 86	158	378 32	182	470 18	
	Steam Engineering.....	.....	.....	6	26 17	37	97 96	43	124 13	
	Provisions and Clothing.....	.....	.....	11	39 09	6	14 26	16	53 35	
	Medicine and Surgery.....	.....	.....	2	4 10	10	6 20	12	10 30	
	Total.....	48	279	71	262 63	303	725 92	374	988 55	
New York.....	Yards and Docks.....			22	70 17	70	170 12	92	240 29	Repairing Galena, Yantic, Alli- ance, and Vanda- lia.
	Equipment and Recruiting.....	.....	.....	4	14 52	64	166 20	68	180 72	
	Navigation.....	.....	.....	3	9 83	13	24 00	16	33 83	
	Ordnance.....	.....	.....	2	6 83	24	56 72	26	63 55	
	Construction and Repair.....	.....	.....	38	150 42	359	1, 052 54	397	1, 202 96	
	Steam Engineering.....	.....	.....	13	53 67	186	439 55	199	493 22	
	Provisions and Clothing.....	.....	.....	19	69 88	42	97 44	61	167 32	
	Medicine and Surgery.....	.....	.....	23	29 85	.....	.....	23	29 85	
	Total.....	7	444	124	405 17	758	2, 006 57	882	2, 411 74	
League Island.....	Yards and Docks.....			11	33 51	23	45 30	34	78 81	Repairing Ossipee.
	Equipment and Recruiting.....	.....	.....	8	20 65	22	61 20	30	81 85	
	Navigation.....	.....	.....	.....	.....	1	2 00	1	2 00	
	Ordnance.....	.....	.....	2	6 24	10	21 00	12	27 24	
	Construction and Repair.....	.....	.....	29	115 38	304	810 34	333	925 72	

[illegible]

PORTSMOUTH, N. H.

I.

List of commissioned and warrant officers of the Navy and Marine Corps attached to the navy-yard, Portsmouth, N. H., November 16, 1883.

Name.	Rank.	Duty.
C. H. Wells	Commodore	Commandant.
Chas. O. Allibone	Lieutenant	Aid to commandant.
A. E. K. Benham	Captain	Captain of the yard, and in charge of department of yards and docks.
Jno. L. Vennard	Mate	In charge of tug Leyden.
B. E. Fernald	Carpenter	Department yards and docks.
A. R. Yates	Commander	Equipment officer.
Jno. McCaffery	Boatswain	Equipment department.
Jno. C. Herbert	Sailmaker	Do.
B. J. Cromwell	Commander	Inspector of ordnance.
Thos. R. Wilson	Gunner	Ordnance department.
Hugh Kuhl	Mate	Do.
F. M. Green	Commander	Navigation officer.
A. C. Heffenger	Passed asst. surgeon	Temporarily in charge of medicine and surgery department.
F. H. Hinman	Paymaster	Inspector of provisions and clothing.
J. Macmahon	do	Purchasing and yard paymaster.
B. F. Garvin	Chief engineer	In charge of department steam engineering.
E. J. Whitaker	do	In charge of stores, department steam engineering.
W. H. Nauman	Passed asst. engineer	Assistant department steam engineering.
Jno. L. Broome	Lieutenant-colonel	Commanding Marine post.
P. C. Pope	Captain	Marine barracks.
Chas. A. Doyen	Second lieutenant	Do.
Jas. E. Mahoney	do	Do.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps a navy-yard, Portsmouth, N. H., November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
Marine barracks			15	53	68
Sick in hospital		1	2	3	6
Tug Leyden	2	1			3
Steam launch	1	4			5
Total	3	6	17	26	82

III.

List of all the civil employes, including foremen, and all persons not ordinary mechanics or workmen, at the navy-yard, Portsmouth, N. H., November 16, 1883.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
COMMANDANT'S OFFICE.				
Oscar G. Sawyer.....	First clerk to commandant.	\$1,500 00	Pay, miscellaneous	\$4 00
John H. Knox.....	Second clerk to commandant.	1,200 00	do	3 29
				<u>7 40</u>
PROVISIONS AND CLOTHING.				
R. H. Paine.....	Pay clerk, yard.....	1,400 00	Pay, miscellaneous	3 84
R. E. Rich.....	Pay yeoman, yard	750 00	Pay of the Navy	2 05
William J. Larkin.....	Clerk at inspection. P. and C.	1,300 00	Pay, miscellaneous	3 56
				<u>9 45</u>
ORDNANCE.				
Freeman F. Sanborn.....	Storekeeper	3 00	Ordnance.....	3 00
EQUIPMENT AND RECRUITING.				
Calvin L. Hayes.....	Clerk of department....	1,300 00	Civil establishment	3 56
H. C. Lovell.....	Foreman sail-maker	5 00	Equipment of vessels...	5 00
William H. Pinkham.....	Leader of riggers.....	3 50	do	3 50
Henry H. Ham.....	Store helper	3 00	do	3 00
				<u>15 06</u>
NAVIGATION.				
Charles R. Littlefield.....	Clerk of department....	1,000 00	Civil establishment.....	2 74
YARDS AND DOCKS.				
William A. Gilman.....	Clerk of department ...	1,400 00	Civil establishment.....	3 84
John Wentworth.....	Store clerk	1,300 00	do	3 56
William A. Ashe.....	Writer	3 00	General maintenance ...	3 00
William H. Anderson.....	Mail messenger.....	2 23	do	2 23
Charles Carpenter.....	Commandant's messenger.	2 00	do	2 00
Cyrus H. Hobbs.....	Foreman of teamsters and laborers.	4 00	do	4 00
Romanti Chase	Leader of laborers.....	2 00	do	2 00
				<u>20 63</u>
MEDICINE AND SURGERY.				
Andrew R. Wentworth	Apothecary	750 00	Pay of the Navy	2 05
George B. Wilson.....	Assistant nurse.....	160 00	Civil establishment.....	43
Sarah A. Grant.....	Assistant cook	160 00	do	43
Edward Boston.....	Laborer	160 00	do	43
				<u>3 34</u>
NAVAL QUARANTINE STATION. WOOD ISLAND.				
John E. Lawry.....	Watchman	2 00	Contingent Navy	2 00
STEAM ENGINEERING.				
Amos G. Goodwin	Clerk of department....	\$1,200 00	Civil establishment.....	\$3 29
Rufus C. Goodwin	Store clerk.....	3 59	Steam machinery	3 59
Alfred M. Lang.....	Messenger.....	1 75	do	1 75
John H. Flagg.....	Foreman machinist.....	5 25	do	5 25

List of all the civil employes, including foremen and all persons, &c.—Continued.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
STEAM ENGINEERING—cont'd.				
Henry Knight.....	Quarterman machinist..	\$3 76	do	\$3 76
Edwin D. Rand	do	3 50	do	3 50
Samuel H. Pilsbury.....	Foreman pattern-maker..	5 00	do	5 00
James N. Knapp.....	Foreman boiler-maker..	5 25	do	5 25
Richard H. Waldron.....	Foreman molder	5 00	do	5 00
Oliver G. Fernald	Foreman coppersmith ..	5 00	do	5 00
				41 39
CONSTRUCTION AND REPAIR.				
Thomas F. Staples.....	Clerk of department....	1,400 00	Civil establishment.....	3 84
John E. Colcord	Store clerk.....	1,300 00	do	3 59
D. W. Barnabee.....	Writer.....	3 31	Construction and repair..	3 31
G. W. S. Putnam	do	3 31	do	3 31
Oliver S. Loomis	do	3 31	do	3 31
William H. Emery.....	Draughtsman.....	5 00	do	5 00
T. J. Pettigrew	Assistant draughtsman..	3 50	do	3 50
Daniel Perry	Superintendent of dry-dock.	4 00	do	4 00
John H. Locke	Measurer of timber	3 50	do	3 50
Joseph H. Gardiner.....	Receiver and deliverer..	3 50	do	3 50
Michael Murphy	Special store hand	2 50	do	2 50
William F. Noyes.....	Master carpenter in charge of department.	6 50	do	6 50
James W. Brooks	Master joiner.....	5 00	do	5 00
George W. Muchmore	Master smith	5 00	do	5 00
John S. Howell	Master iron-plater	5 00	do	5 00
Charles A. Wendell.....	Master spar-maker	5 00	do	5 00
Augustus Stevenson	Master boatbuilder	5 00	do	5 00
Stephen L. Marston	Master plumber	5 00	do	5 00
Moses D. Moore.....	Master painter.....	5 00	do	5 00
Charles N. Osgood	Master calker	5 00	do	5 00
Theodore Wilcox	Sawyer in charge of mill..	3 50	do	3 50
John A. George.....	Pattern-maker in charge of shop.	3 76	do	3 76
John A. Rogers.....	Shipwright in charge of mold loft.	3 50	do	3 50
Mark Fernald.....	Quarterman shipwright..	3 76	do	3 76
Moses Plummer	do	3 76	do	3 76
William A. Fernald.....	do	3 76	do	3 76
A. P. Wentworth	Leader joiner	3 24	do	3 24
J. W. Pryor.....	do	3 24	do	3 24
				114 35

IV.

Statement of the number of all other persons employed at the United States navy-yard, Portsmouth, N. H., November 16, 1883.

Rate.	Number.	Total of the pay-roll for the day in each class.
PROVISIONS AND CLOTHING.		
<i>Inspection of provisions, &c.</i>		
Cooper.....	1	\$3 00
Helper.....	1	2 26
Laborer.....	1	2 00
<i>Pay office, yard.</i>		
Laborer.....	1	2 50
	4	9 76
ORDNANCE.		
Special laborer.....	1	2 00
Special laborer.....	1	1 76
Rigger.....	1	3 00
	3	6 76
EQUIPMENT AND RECRUITING.		
Sail-makers (1 apprentice).....	10	28 00
Riggers (1 apprentice).....	13	37 00
Blacksmith.....	1	3 26
Blacksmith helper.....	1	2 00
Store laborers.....	2	4 26
Common laborer.....	1	1 50
Fireman.....	1	2 00
Painters.....	2	5 52
	31	83 54
NAVIGATION.		
Laborer.....	1	2 00
YARDS AND DOCKS.		
Joiner.....	1	2 76
Carpenters.....	2	5 52
Joiner laborer.....	1	2 00
Horse teamsters.....	2	4 00
Special laborers.....	3	5 28
Common laborers.....	4	6 00
Boy.....	1	76
Engineer, steam fire-engines.....	1	4 00
Engineer, ferry-boat Emerald.....	1	3 00
Firemen.....	6	12 52
Machinist.....	1	3 00
Pilot.....	1	3 00
Plumber.....	1	3 00
Smith.....	1	2 76
Gas-maker.....	1	2 50
Gas-maker helper.....	1	2 00
Captain of the watch.....	1	2 76
Watchmen.....	6	12 00
	35	76 86
STEAM ENGINEERING.		
Machinists (3 apprentices).....	22	53 86
Pattern-makers.....	4	11 26
Boiler-makers.....	11	26 76
Blacksmiths.....	3	7 26
Molders (1 apprentice).....	5	12 98
Coppersmiths.....	3	8 02
Laborers.....	17	33 52
	65	153 66

Statement of the number of all other persons employed, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day in each class.
CONSTRUCTION AND REPAIR.		
Shipwrights (4 apprentices)	88	\$255 66
Fasteners	32	72 32
Sawyers	4	11 76
Joiners (5 apprentices)	32	89 70
Pattern-makers	2	6 52
Shipsmiths (4 apprentices)	19	44 42
Iron platers (3 apprentices)	22	59 49
Spar-makers (1 apprentice)	11	30 66
Boatbuilders (1 apprentice)	14	39 66
Painters (2 apprentices)	8	19 28
Plumbers (2 apprentices)	8	21 32
Brass-founders	5	14 52
Engineers	5	14 52
Firemen	3	6 78
Laborers	49½	93 50
Calkers (1 apprentice)	32	83 00
Shipkeepers	6	12 00
Coopers	2	6 00
	342½	881 11

V.

Statement of work being performed on or for vessels of war at the navy-yard, Portsmouth, N. H., on the 16th day of November, 1883.

Bureau of Provisions and Clothing.—General office and storehouse duties.

Bureau of Ordnance.—Preparing the ordnance outfit of the U. S. S. Marion.

Bureau of Equipment and Recruiting.—Entire force excepting fireman employed on the U. S. S. Marion. Sail-makers making sails and sail-maker's outfits. Riggers making rigging and miscellaneous gear. Smiths making iron-work. Painters painting canvas, and store force on stores.

Bureau of Navigation.—Preparing stores of U. S. S. Marion and Omaha.

Bureau of Yards and Docks.—General yard work.

Bureau of Steam Engineering.—Repairing and connecting machinery, boilers, &c., of Omaha; also overhauling and repairing machinery, &c., of the Marion.

Bureau of Construction and Repair.—Repairing U. S. S. Marion and Omaha.

Bureau of Medicine and Surgery.—Care of buildings, stores, and of sick.

BOSTON.

I.

List of commissioned and warranted officers of the Navy and Marine Corps on duty at the United States naval station, Boston, Mass., November 16, 1883.

Name.	Rank.	Duty.
Oscar C. Badger	Commodore	Commandant of station.
Ralph Chandler	Captain	Captain of yard.
E. K. Rawson	Chaplain	Chaplain of station.
C. J. Badger	Lieutenant	Commandant's aid.
J. E. Keen	Carpenter	In charge yard scales.
William Jenney	Mate	General yard duty.
G. F. F. Wilde	Lieutenant-commander	Assistant inspector of ordnance, in charge of department.
Robert Platt	Lieutenant	In charge of niter depot, Malden.
T. B. Watkins	Gunner	Magazine, Chelsea.
Felix Cassidy	do	Yard duty.
E. P. Lull	Captain	Equipment officer, in charge of department.
J. B. Aiken	Boatswain	Rigging loft and general equipment duty.
H. T. Stocker	Sailmaker	General equipment duty.
John Griffin	Mate	Do.
Charles V. Gridley	Commander	Navigation officer in charge of department.
U. S. G. White	Civil engineer	In charge of department.
Josiah P. Carter	Carpenter	General duty in department.
George F. Winslow	Surgeon	Yard duty, examining recruits, and attending sick at Marine barracks.
Charles W. Abbot	Pay director	Purchasing pay officer; office in Boston.
A. H. Gilman	do	Inspector of provisions and clothing (yard).
J. F. Tarbell	Paymaster	Paymaster of yard and station.
E. D. Robie	Chief engineer	In charge of department.
C. H. Baker	do	In charge of stores.
Samuel Gragg	Passed assistant engineer	Assistant to chief engineer of yard.
George E. Burd	Assistant engineer	Do.
Thomas E. Webb	Naval constructor	In charge of department.
A. C. Gorgas	Medical inspector	In charge of hospital.
C. U. Gravatt	Passed assistant surgeon	Assistant.
H. P. Harvey	do	Do.
C. D. Hebb	Lieutenant-colonel	Commanding post.
R. L. Meade	Captain	Barracks.
G. F. Elliott	First lieutenant	Do.
W. F. Spicer	do	Do.
F. M. Bunce	Captain	Commanding receiving ship Wabash.
O. W. Farenholt	Lieutenant-commander	Executive officer.
J. C. Morong	Lieutenant	Navigator and enlistment officer.
W. A. Morgan	do	Watch officer.
H. R. Tyler	do	Do.
William Winder	do	Do.
C. F. Guild	Paymaster	
James A. Hawke	Surgeon	
John M. Edgar	Assistant surgeon	
George W. Hall	Passed assistant engineer	General duties in engineer's department and examiner of recruits.
James Nash	Boatswain	
M. K. Henderson	Gunner	
Thomas P. Smith	Carpenter	
W. W. Beck	Mate	
F. H. Poole	do	

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps, at naval station, Boston, Mass., November 16, 1883.

Location of duty.	Navy.		Marine corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
Marine barracks			20	74	94
U. S. receiving ship Wabash	55	77	4	15	151
Sick in hospital		18	1	7	26
Prisoners: at barracks, 5; at Wethersfield, 3		4		4	8
Total	55	99	25	100	279

III.

List of all the civil employés, including foremen and all persons not ordinary mechanics or working men, at the naval station, Boston, Mass., November 16, 1883.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
COMMANDANT'S OFFICE.				
John W. Hudson.....	First clerk to commandant..	\$1,500 00	Pay, miscellaneous.....	\$4 11
Henry W. Leonard.....	Second clerk to commandant.	1,200 00	do	3 29
PROVISIONS AND CLOTHING.				7 40
John F. Fergusson.....	Paymaster's clerk (inspector)	1,600 00	Pay, miscellaneous.....	4 38
A. R. Thompson	Writer (inspector)	1,017 25	Civil establishment.....	2 78
Benj. J. Perkins.....	Receiver (inspector)		Provisions	3 00
J. H. H. Wilson	do		do	3 00
E. K. Bordman.....	Writer (pay office)	1,017 25	Civil establishment.....	2 78
David Vaughan.....	Paymaster's clerk (pay office)	1,600 00	Pay, miscellaneous	4 38
Jacob Harder.....	do	1,600 00	do	4 38
ORDNANCE.				24 70
T. R. Roulstone	Quarterman		Ordnance	3 76
Chas. Asbrand.....	do		do	3 76
EQUIPMENT AND RECRUITING.				7 52
George H. Burr	Clerk	1,300 00	Civil establishment.....	3 56
M. H. Webber.....	Supt. of ropewalk.....		Equipment of vessels.....	6 00
C. H. Webber	Writer.....		do	3 25
Benj. D. Wiley	Foreman of sail-makers		do	5 00
Thos. J. Chapman.....	Foreman of machinists		do	5 00
Joseph Pedrick	Foreman of rope-makers.....		do	5 00
Henry T. Gardner.....	Quarterman.....do		do	3 76
C. R. Streeter	Leading-man, sail-makers.....		do	3 24
John Stark.....	do.....riggers		do	3 24
E. G. Currell	Special man		do	3 00
YARDS AND DOCKS.				41 05
Thos. H. Haskell	Clerk to civil engineer.....	1,400	Civil establishment.....	3 84
Wm. E. Delano.....	Store clerk.....	1,300	do	3 56
C. R. Whitney.....	General foreman.....		Closed navy-yards and stations.	5 00
J. H. Eldridge.....	Foreman of laborers		do	4 50
Joel Raymond	Quarterman of masons.....		do	3 76
Geo. E. Cornwall	Writer.....		do	3 26
John Bear	Rodman.....		do	3 00
E. A. Barry	Engineer, steam fire-engine.		General maintenance.....	3 00
George Bass	do		do	3 00
J. A. Grady	Driver.....do		do	2 50
Thos. Downs.....	do		do	2 50
E. H. Elliott.....	do		do	2 50
W. A. C. Stark	Mail messenger.....		do	2 26
C. F. Ripley	Captain of watch.....		do	2 76
MEDICINE AND SURGERY.				45 44
Joseph H. Graham.....	Apothecary naval hospital..	750 00	Pay of the Navy.....	2 05
Wm. H. Russell	do.....yard dispensary	750 00	do	2 05
STEAM ENGINEERING.				4 10
W. J. Mansfield.....	Chief clerk	1,200 00	Civil establishment.....	3 29
C. C. L. Moore.....	Store writer.....		Steam machinery.....	3 60
W. H. Chapman.....	Foreman machinery afloat ..		do	5 26
John Estle.....	do.....boiler-maker		do	5 26
James Bell.....	do.....blacksmiths		do	5 00
J. D. Folsom	Quarterman machinists.....		do	3 76
				26 17

List of all the civil employes, including foremen and all persons, &c.—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
CONSTRUCTION AND REPAIR.				
D. A. Green	Chief clerk	\$1,400	Civil establishment	\$3 84
Moors Patee	Store clerk	1,300	do	3 56
E. W. Hayes	Writer		Construction and repair	3 31
Merton Simonds	do		do	3 31
Chas. S. Beatley	do		do	3 31
Chas. H. Simonds, jr.	Draughtsman		do	5 00
John D. Torrey	Assistant draughtsman		do	3 50
A. T. Greene	Timber inspector		do	4 50
J. L. Nicolson	Master carpenter		do	5 50
Wm. Hichborn	Master joiner		do	5 00
Samuel Dwight	Master shipsmith		do	5 00
John H. Roberts	Master iron-plater		do	5 00
Theo. A. Melvin	Master spar-maker		do	5 00
Wm. H. Rigby	Master boatbuilder		do	5 00
J. H. Edgerly	Master painter		do	5 00
Alden Sampson	Master calker		do	5 00
E. S. Sullivan	Quartermen plumbers		do	4 50
A. A. Woodward	Quartermen molders		do	4 50
Albert Thompson	Quartermen laborers		do	2 52
C. F. Whittemore	Toolkeeper		do	2 50
S. P. Edwards	Receiver and deliverer		do	2 76
E. P. Robinson	Special store hand		do	2 50
Frank F. Streeter	Assistant inspector of material.		Steel cruisers	2 75
A. B. Russell	Assistant inspector of material.		do	2 00
NAVY PAY OFFICE, BOSTON.				91 86
F. M. Josselyn	Chief clerk	2,000	Contingent, Navy	5 48
Wm. P. Eddy	Clerk	1,400	do	3 84
P. D. Walbridge	do	1,200	do	3 29
Chas. Overton	Messenger	650	do	1 78
				14 39

IV.

Statement of the number of mechanics, laborers, &c., employed at the United States naval station, Boston, Mass., on November 16, 1883.

Rate.	Number employed.	Total of the pay roll for the day in each class.
ORDNANCE.		
Storekeeper	1	\$3 50
Watchmen	2	5 00
Laborers	4	8 04
	7	16 54
EQUIPMENT AND RECRUITING.		
Sail-makers (3 apprentices)	11	27 60
Rope-makers	30	90 86
Machinists	5	14 50
Engine-tenders	3	8 28
Fireman	1	2 26
Blacksmith	1	2 76
Laborers	3	5 52
Boys	3	2 76
Painter	1	3 00
	58	157 54
NAVIGATION.		
Laborers	2	4 00
YARDS AND DOCKS.		
Machinist	1	3 00
Blacksmith	1	3 00
Painter	1	2 76
Laborers	10	18 34
Watchmen	12	24 00
	25	51 10

IV.—Statement of the number of mechanics, laborers, &c., employed, &c.—Continued.

Rate.	Number employed.	Total of the pay-roll for the day in each class.
MEDICINE AND SURGERY.		
Engine-tender, naval hospital.....	1	\$1 16 ⁰⁰ / ₁₀₀
Fireman, naval hospital.....	1	66 ⁰⁰ / ₁₀₀
Ambulance driver, naval hospital.....	1	80
Watchman and laborer, naval hospital.....	1	66 ⁰⁰ / ₁₀₀
Gatekeeper, naval hospital.....	1	43 ¹⁰ / ₁₀₀
Nurses, naval hospital.....	2	1 07
Cook, naval hospital.....	1	56 ⁰⁰ / ₁₀₀
Laundress, naval hospital.....	1	50
Scrubber, navy-yard dispensary.....	1	33 ¹⁰ / ₁₀₀
	10	6 20
PROVISIONS AND CLOTHING.		
Cooper, inspection.....	1	3 00
Carpenter, inspection.....	1	3 00
Laborers, inspection.....	2	4 00
Fireman, inspection.....	1	2 26
Laborer, pay office.....	1	2 00
	6	14 26
STEAM ENGINEERING.		
Coppersmiths.....	3	9 02
Molder.....	1	3 50
Machinists.....	7	21 56
Pattern-makers.....	2	5 76
Boiler-makers.....	3	9 02
Blacksmith.....	1	3 26
Forgemen.....	2	7 00
Hammer-runner.....	1	2 50
Special man.....	1	3 50
Engine-tender.....	1	2 76
Firemen.....	3	6 78
Special laborer.....	1	2 26
Laborers.....	4	7 04
Helpers.....	7	14 00
	37	97 96
CONSTRUCTION AND REPAIR.		
Shipwrights.....	20	61 52
Saw-filer.....	1	3 00
Borers.....	33	82 26
Sawyer, in charge of mill.....	1	3 50
Joiners.....	15	44 28
Joiners' helper.....	1	2 00
Shipsmiths.....	5	16 04
Shipsmiths' helpers.....	7	14 00
Flange-turner.....	1	3 50
Iron-platers' helpers.....	2	4 00
Machinists.....	4	11 52
Engine-tenders.....	3	8 28
Firemen.....	4	9 04
Block-maker.....	1	3 00
Cooper.....	1	3 00
Boatbuilders.....	2	6 00
Boatbuilders' helper.....	1	2 00
Painters.....	2	5 52
Plumbers.....	2	6 52
Plumbers' helper.....	1	2 00
Molder.....	1	3 26
Core-maker.....	1	2 50
Storehouse laborers.....	2	4 52
Laborers.....	23	40 92
Shipkeepers.....	3	6 00
Teams.....	3	6 00
Apprentices.....	18	24 14
	158	378 32

V.

Statement of all the work being performed at the U. S. naval station, Boston, Mass., by the different departments, on vessels or otherwise, November 16, 1883.

Ordnance.—Preparing stores for, and delivering ammunition to the U. S. S. Shenandoah; also guarding public property at magazine, Chelsea, Mass.

Equipment and Recruiting.—Rope-makers: Manufacturing cordage for U. S. S. Marion and Yantic. Sail-makers: Making sails for U. S. S. Powhatan, and hammocks and clothes-bags for issue to the U. S. S. Wabash. Machinists: Repairing ropewalk machinery. Painter: Painting hammock-cloths for U. S. S. Hartford. Laborer: Repairing equipment scow.

Navigation.—Delivering stores to the U. S. S. Shenandoah; general office and storehouse work.

Yards and Docks.—Repairing building No. 66; connecting steam pipe, building No. 5; glazing windows in building No. 42; shoeing horses and oxen; cleaning and clearing up yard.

Medicine and Surgery.—Employés engaged in general hospital work.

Provisions and Clothing.—Provisioning the U. S. S. Shenandoah and Powhatan; overhauling stock of provisions and clothing, &c.

Steam Engineering.—Repairing paddle-wheel of U. S. S. Powhatan; fitting exhaust steam blast, and repairing suction hose of fire apparatus U. S. tug Rocket; fitting out and equipping engineer's department of U. S. S. Shenandoah.

Construction and Repair.—Breaking up the U. S. S. Connecticut; making and repairing tools used for this purpose; repairing third cutter and two gangway pumps; making new buckets for paddle-wheel, and sawing stock for stores of U. S. S. Powhatan; repairing and putting on accommodation ladders and platform on port side of the Shenandoah, with other miscellaneous jobs on board that vessel; making cushion for engine-room, hose-lockers, and seats in forecastle of the tug Rocket; making mess-tables, benches, and deck-buckets for the U. S. S. New Hampshire; inspecting material at the Bay State Iron Works for steel cruisers; preparing turret plans, specifications, and schedule of materials for the U. S. S. Miantonomoh.

NEW YORK.

I.

List of commissioned or warranted officers, of the Navy and Marine Corps, on shore duty at navy-yard, New York, including receiving-ships and tugs and navy pay office, on November 16, 1883.

Names.	Rank.	Duty.
John H. Upshur	Commodore	Commandant of yard.
R. W. Meade	Captain	Captain of the yard.
Theo. F. Kane	Commander	Inspector of ordnance.
J. C. Watson	do	Equipment officer.
W. H. Whiting	do	Assistant to captain of the yard.
S. Hubbard	Lieutenant-commander ...	Equipment department.
W. H. Jaques	Lieutenant	Aide to commandant on temporary detached duty.

List of commissioned and warranted officers of the Navy and Marine Corps, &c.—Continued.

Names.	Rank.	Duty.
R. E. Carmody	Lieutenant	Ordnance department.
E. W. Bridge	do	Acting navigation officer.
H. L. Tremain	do	Assistant to captain of the yard.
H. C. T. Nye	do	Ordnance department.
Aaron Ward	do	Aide to commandant.
Richard C. Dean	Medical director	In charge naval hospital.
Delavan Bloodgood	Medical inspector	In charge naval laboratory.
John C. Spear	do	Surgeon of yard.
Henry M. Wells	Surgeon	Naval hospital.
M. D. Jones	Passed assistant surgeon ..	Do.
F. B. Stephenson	do	Navy-yard.
L. G. Heneberger	do	Do.
George C. Lippincott	do	Naval hospital.
John S. Cunningham	Pay director	Inspector provisions and clothing.
John H. Stevenson	Pay inspector	Paymaster of yard.
Thomas T. Caswell	do	Purchasing and disbursing officer.
John Q. Lovell	Assistant paymaster	Inspection provisions and clothing.
Charles H. Loring	Chief engineer	In charge steam-engineering department, on temporary detached duty,
George W. Magee	do	In charge steam-engineering stores.
Nathan P. Towne	Passed assistant engineer ..	Steam-engineering department.
Arthur Price	do	Do.
John R. Matthews	Chaplain	Navy-yard.
W. L. Mintonye	Naval constructor	In charge construction department.
George F. Mallett	Assistant naval constructor.	Construction department.
F. C. Prindle	Civil engineer	In charge yards and docks department.
Frank O. Maxson	do	Yards and docks department, duty connected with building sewer.
James T. Barker	Boatswain	Equipment department.
Thomas W. Brown	do	Do.
William Wilson	Gunner	Ordnance department.
John A. McDonald	do	Do.
James Hayes	Gunner	Ordnance department, naval magazine, Ellis Island.
William D. Toy	Carpenter	Construction department.
L. B. Gallagher	Mate	Police office.
Charles Wilson	do	Do.
Charles Heywood	Major, United States Marine Corps.	Commanding Marine barracks.
Henry J. Bishop	Captain, United States Marine Corps.	Marine barracks.
E. P. Meeker	do	Do.
E. R. Robinson	First lieutenant, United States Marine Corps.	Do.
A. C. Kelton	do	Do.
G. R. Benson	do	Do.
Harry K. White	Second lieutenant, United States Marine Corps.	Do.
W. A. Kirkland	Captain	Commanding U. S. R. S. Colorado.
Jacob E. Noël	Lieutenant-commander ..	Executive officer Colorado.
George B. Livingston	do	U. S. R. S. Colorado.
A. B. H. Lillie	Lieutenant	Do.
Frederick Singer	do	Do.
P. J. Werlich	Ensign	Do.
Henry C. Fuller	Mate	Do.
Alex. McIntosh	do	Do.
Edward Kershner	Surgeon	Do.
Howard E. Ames	Passed assistant surgeon ..	Do.
Charles W. Rush	do	Do.
James E. Tolfree	Paymaster	Do.
Jefferson Brown	Passed assistant engineer ..	Do.
James Forney	Captain, United States Marine Corps.	Do.
John C. Thompson	Boatswain	Do.
Andrew Harman	Gunner	Do.
F. S. Sheppard	Acting carpenter	Do.
C. C. Freeman	Sailmaker	Do.
B. F. Isherwood	Chief engineer	President experimental board.
Theo. Zeller	do	Experimental board.
George P. Hunt	do	Do.
W. C. Eaton	Passed assistant engineer ..	Do.
B. F. Wood	do	Special duty Morgan Iron Works.
H. J. Babin	Surgeon	Marine rendezvous, New York.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps at navy-yard, New York, November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
Marine barracks			24	177	201
U. S. receiving ship Colorado	53	75	3	39	170
Sick in hospital	10	45	2	8	65
Prisoners at barracks	1	3		4	8
Total	64	123	29	228	444

III.

List of all the civil employes, including foremen and all persons not ordinary mechanics or workmen, at the navy-yard, New York, November 16, 1883.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
COMMANDANT'S OFFICE.				
Rulif Van Brunt	First clerk to commandant.	\$1,500 00	Pay, miscellaneous	\$4 10
Geo. E. Welch	Second clerk to commandant.	1,200 00	do	3 28
PROVISIONS AND CLOTHING.				7 38
Theo. W. Arms	Pay clerk, yard	1,600 00	Pay, miscellaneous	4 38
Thos. H. Pratt	Pay yeoman, yard	750 00	Pay of the Navy	2 05
Chas. Blake	Pay clerk, Colorado	1,600 00	do	4 38
Wm. J. Thorne	Clerk, inspection provisions and clothing.	1,600 00	Pay, miscellaneous	4 38
YARDS AND DOCKS.				15 19
Benj. F. Burtis	Clerk of department	1,400 00	Civil establishment	3 83
Sam'l F. Cranston	Store clerk	1,300 00	do	3 56
Chas. M. Cooper	Writer	1,017 25	do	3 25
Chas. H. Morrell	do	1,017 25	do	3 25
<i>Per diem.</i>				
B. O'Rourke	Draughtsman	5 00	Navy-yard, New York	5 00
Ellis B. Noyes	Leveler	4 00	Navy-yard, Brooklyn	4 00
John Vanderbilt	Store assistant	2 76	General maintenance	2 76
Alex. Barnie, jr.	General foreman	5 00	do	5 00
Morris J. Ward	Foreman laborer	4 50	do	4 50
Thos. C. Baker	Engineer fire department ..	3 70	do	3 70
Noah Smith	Stable-keeper	2 00	do	2 00
Thos. McGrath	do	2 00	do	2 00
A. D. Smith	Mail messenger	2 26	do	2 26
Thos. Meagher	Captain of watch	3 00	do	3 00
Jas. Dunloy	do	3 00	do	3 00
John E. Denham	Roundsman of watch	2 50	do	2 50
Peter W. Fagan	do	2 50	do	2 50
Jas. W. Quinn	Commandant's messenger ..	2 26	do	2 26
Rob't McGee	Yards and docks messenger.	2 26	do	2 26
W. F. C. Nindemann ..	Captain's messenger	2 26	do	2 26
EQUIPMENT AND RECRUITING.				62 89
W. T. Remsen	Writer	4 00	Equipment of vessels	4 00
W. H. Blamey	Receiver	3 26	do	3 26
Jas. Daly	Foreman sail-maker	5 00	do	5 00
Jas. Diana	Messenger	2 26	do	2 26
NAVIGATION.				14 52
John Teer	Clerk of department	1,400 00	Civil establishment	3 83
<i>Per diem.</i>				
Jas. Crimmins	Storekeeper	3 00	Navigation	3 00
Jas. Bourke	Special man	3 00	do	3 00
				9 83

List of all the civil employes, &c., at the navy-yard, New York, &c.—Continued.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
ORDNANCE.				
John Van't Wond	Clerk of department	\$1,400 00	Civil establishment	\$3 83
Fred'k W. Dow	Storekeeper	<i>Per diem.</i> 3 00	Ordnance	3 00
CONSTRUCTION AND REPAIR.				6 83
J. A. Brackenridge	Clerk of department	1,400 00	Civil establishment	3 83
John Foote	Store clerk	1,300 00	do	3 56
<i>Per diem.</i>				
George Wilson	Writer	3 31	Construction and repair	3 31
Lewis G. Wells	do	3 31	do	3 31
Albert M. Kingsland	do	3 31	do	3 31
G. W. B. Jackson	Draughtsman	5 00	do	5 00
A. B. Cassidy	Assistant draughtsman	4 00	do	4 00
Frank Grogan	do	4 00	do	4 00
Leslie G. King	do	3 50	do	3 50
Peter E. Ogilvie	Master shipwright	5 50	do	5 50
Mathew J. Betts	Quartermaster shipwright	4 02	do	4 02
Jacob Kingsland	do	4 02	do	4 02
A. J. Kemble	Leading shipwright	3 50	do	3 50
James R. McGee	do	3 50	do	3 50
Godfrey Lincks	Leading borer	3 10	do	3 10
James Birth	In charge of saw-mill	3 76	do	3 76
James Chambers	Master joiner	5 00	do	5 00
Andrew Childs	Quartermaster joiner	4 02	do	4 02
Edward Dingee	Leading joiner	3 50	do	3 50
James Allison	Master smith	5 00	do	5 00
Isaac Rose	Quartermaster smith	4 16	do	4 16
Arthur J. Boyle	Master iron-plater	5 00	do	5 00
Pierre P. Parsells	Quartermaster iron-plater	4 02	do	4 02
Titus E. Dodge	Master spar-maker	5 00	do	5 00
James Hepenstall	Master boatbuilder	5 00	do	5 00
George W. Freed	Master painter	5 00	do	5 00
William H. Gleavey	Master block-maker	5 00	do	5 00
Henry J. Pattison	Master plumber	5 00	do	5 00
Nehemiah Brush	Leading cooper	3 74	do	3 74
Asa D. Bennett	Quartermaster laborer	2 76	do	2 76
William McNamara	Leading laborer	2 24	do	2 24
John Lee	Master calker	5 00	do	5 00
Alfred Walker	Leading calker	3 50	do	3 50
John Aldridge	Superintendent oakum mill	4 00	do	4 00
Curtis H. Peck	Receiver and deliverer	2 76	do	2 76
Samuel H. Roberts	In charge of floor	2 50	do	2 50
Charles F. Porter	do	2 50	do	2 50
Richard Barrington	Timber inspector	4 50	do	4 50
STEAM ENGINEERING.				150 42
Frederick J. Smith	Clerk of department	1,400 00	Civil establishment	3 83
F. M. Canfield	Store clerk	1,200 00	Steam machinery	3 28
<i>Per diem.</i>				
Edward H. Faron	Writer	3 00	do	3 00
Alfred Blaisdell	Draughtsman	5 00	do	5 00
James P. Howatt	Foreman machinist	5 26	do	5 26
John Anderson	do	5 26	do	5 26
James Hare	Foreman pattern-maker	5 00	do	5 00
John Collins	Foreman boiler-maker	5 26	do	5 26
John Daugherty	Foreman molder	5 00	do	5 00
Ralph Archbold	Foreman coppersmith	5 00	do	5 00
George Raymond	Receiver	3 26	do	3 26
Thomas Thompson	Messenger	2 26	do	2 26
William E. Kisby	do	2 26	do	2 26
PROVISIONS AND CLOTHING.				53 67
Jos. P. Payes	Writer	3 25	Provisions	3 25
F. J. Raymond	do	3 25	do	3 25
William M. Gibson	Receiver of provisions	4 00	do	4 00
R. H. Marsh	Assistant receiver of provisions	3 50	do	3 50
E. S. Van Orden	Receiver of clothing	4 00	do	4 00
William M. Birch	Receiver of small stores	4 00	do	4 00
Thomas Stevenson	Writer, pay office	3 25	do	3 25
H. N. Clapp	do	3 00	do	3 00
G. W. Schultz	Messenger, pay office	2 26	do	2 26
William Barrymore	Pilot of yard tug	4 00	do	4 00
				34 51

List of all the civil employes, &c., at the navy-yard, New York, &c.—Continued.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
MEDICINE AND SURGERY.				
A. D. Smith	Scrubber, dispensary	<i>Per mo.</i> \$10 00	Civil establishment.....	\$0 33
William Peacocke	Clerk, laboratory	<i>Per diem.</i> 2 19	do	2 19
Richard Eagan	Carpenter, laboratory	2 32	do	2 32
P. A. Joyce	Storekeeper, laboratory	2 32	do	2 32
J. McMahon	Shipping porter, laboratory	2 19	do	2 19
John W. Lee	Packer, &c., laboratory	1 57	do	1 57
P. McCann	Driver	1 39	do	1 39
J. Marnell	Fireman	97	do	97
J. Webber	Gatekeeper	1 00	do	1 00
M. Fleming	Gardener	1 08	do	1 08
J. P. Strickler	Nurse	58	do	58
J. F. Foley	do	58	do	58
J. Hall	Laundress	57	do	57
C. Hill	Cook	62	do	62
E. Marnell	Laborer	93	do	93
M. Kerney	do	63	do	63
J. Shaw	Nurse	<i>Per mo.</i> 15 50	Pay of the Navy.....	52
O. Kravigney	do	15 50	do	52
James Ryan	Apothecary, second class, laboratory.	40 00	do	1 34
J. A. Zabriskie	Apothecary, first class, yard.	<i>Per an.</i> 750 00	do	2 05
L. G. Louis	Apothecary, first class, barracks.	750 00	do	2 05
John Peacocke	Apothecary, first class, hospital.	750 00	do	2 05
Charles E. Reynolds ...	Apothecary, first class, Colorado.	750 00	do	2 05
				29 85
NAVY PAY OFFICE.				
John G. Sankey	Chief clerk	2,000 00	Contingent Navy.....	5 47
P. T. Roache	Clerk	1,900 00	do	5 20
W. B. Carrington	do	1,500 00	do	4 10
W. E. H. Merritt	do	1,000 00	do	2 73
James Hanlon	Messenger	<i>Per mo.</i> 80 00	do	2 68
				20 18

IV.

Statement of the number of mechanics, laborers, &c., employed at the naval station, New York, on November 16, 1883.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF YARDS AND DOCKS.		
Store laborer.....	1	\$2 26
Bell-ringer.....	1	2 26
Watchmen.....	12	24 00
Leading wharf-builder.....	1	3 00
Wharf-builder	1	2 76
Plumbers	2	6 26
Stone-mason	1	4 00
Brick-mason	2	8 00
Masons' helper.....	1	2 20
Hod-carrier.....	1	2 60
Harness-maker	1	3 00
Slater	1	3 00
Pavers.....	6	22 50
Laborers.....	26	50 52
Engineer, fire-engine.....	1	3 00
Fireman, fire-engine	1	2 50
Fireman, stationary engine.....	1	2 00
Teamsters	3	7 26

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF YARDS AND DOCKS—continued.		
Gardener	1	\$2 26
Joiners	3	8 02
Painters	2	6 52
Painters' helper	1	2 20
	70	170 12
BUREAU OF EQUIPMENT AND RECRUITING.		
Laborers	29	58 26
Engineer	1	3 00
Painters	2	7 26
Carpenter	1	3 26
Blacksmith	1	3 40
Riggers	3	9 50
Sail-makers	25	75 00
Tinners	2	6 52
	64	166 20
BUREAU OF NAVIGATION.		
Compass-fitter	1	3 00
Laborers	6	12 00
Flag-makers	6	9 00
	13	24 00
BUREAU OF ORDNANCE.		
Gun-carriage makers	3	9 30
Joiner	1	3 26
Machinist	1	3 40
Engine-tender	1	2 76
Ordnance men	2	4 52
Laborers	5	10 00
Messenger	1	2 00
Technicians	10	21 48
	24	56 72
BUREAU OF CONSTRUCTION AND REPAIR.		
Shipwrights (4 apprentices)	55	184 34
Borers	13	36 68
Mill-sawyers	4	11 00
Millmen	9	17 28
Joiners (4 apprentices)	48	162 82
Pattern-makers	2	7 00
Shipsmiths (2 apprentices)	12	42 24
Shipsmiths' helpers	14	30 80
Hammerman	1	4 00
Saw-filer	1	2 76
Iron-platers (2 apprentices and 1 minor)	22	73 10
Iron-platers' helpers	5	13 20
Heaters	2	2 20
Spar-makers (1 apprentice)	3	11 74
Boatbuilders (1 apprentice and 1 minor)	15	50 92
Painters (2 apprentices)	24	82 26
Painters' helper	1	2 20
Block-makers (1 apprentice)	12	40 10
Plumbers (2 apprentices and 2 minors)	6	28 48
Plumbers' helper	1	2 00
Molders, brass	3	10 20
Coppersmiths	2	6 50
Cooper's apprentice	1	1 22
Engineers	6	18 00
Firemen	8	16 00
Laborers	55	100 16
Messenger	1	2 26
Calkers	15	52 48
Oakum-makers	7	16 80
Spinners	2	4 00
Shipkeepers	9	19 80
	359	1,052 54
BUREAU OF STEAM ENGINEERING.		
Machinists	33	103 20
Machinists' helpers	13	28 60

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF STEAM ENGINEERING—continued.		
Pipe-fitter	1	\$3 26
Laborers	33	60 72
Pattern-makers	6	20 28
Flange-turners	2	6 80
Boiler-makers	19	57 52
Boiler-makers' helpers	31	63 00
Rivet-heaters	3	3 30
Molders	4	12 40
Molders' helpers	6	12 60
Furnacemen	1	2 50
Coppersmiths	3	9 50
Coppersmiths' helpers	3	6 20
Riggers	2	6 26
Engine-tenders	2	5 76
Apprentices	12	13 39
Boys	5	5 10
Blacksmiths	2	6 80
Blacksmiths' helpers	3	6 60
Painter	1	2 76
Engineer, fire-engine	1	3 00
	186	439 55
BUREAU OF PROVISIONS AND CLOTHING.		
Coopers	2	7 00
Box-maker	1	3 00
Engine-tender	1	3 26
Fireman	1	2 00
Superintendent of mills	1	3 00
Coffee-roaster	1	2 50
Pressman	1	2 76
Laborers	30	64 16
Messenger	1	2 26
Leading-men	3	7 50
	42	97 44

V.

Statement of the work in progress at navy-yard, New York, on November 16, 1883.

Bureau of Yards and Docks.—Repairing water-pipes; repairing ceilings and painting floors, house D; setting curb and gutter stones; paving and repairing streets and railroad tracks; leveling and grading Dock street, preparatory to repairing; locating stations for resurvey of yard and water front; laying sewer-pipe to connect Marine barracks grounds with the new intercepting sewer; digging trenches for sewer-pipe and connecting street gutters, &c., with new sewer; cleaning and clearing up streets; care of public grounds and buildings; handling materials for mechanics' use; arranging materials for appraisement by Statutory Board; repairing harness; repairing slate roofs; driving piles for launching ways preparatory to hauling up the U. S. S. Intrepid; repairing yard fences; firing under boilers for heating officers' quarters; trucking and carting required by all departments of the yard; cleaning and care of fire engines, hose-carts, hose, and fire-telegraph apparatus; glazing Yards and Docks storehouse and shops; replastering and refitting paymaster's office; introducing steam heating apparatus into Lyceum building; preparing to shove up second floor of spar-shed and repair same; preparing plans and data for Commission on Navy-Yards.

Bureau of Equipment and Recruiting.—Repairing chairs; painting hammock cloths; repairing handy-billy pumps; firing under boilers for

heating and hoisting; refitting rigging-loft gear; completing sails for U. S. S. Alliance; completing wind-sails for U. S. S. Yantic; making cloth-bags; making mattresses and picking hair; care of floors in building; inventory of stock (Statutory Board); weighing and delivering coal; making pipe for U. S. S. Portsmouth.

Bureau of Navigation.—Manufacturing flags for the service; receiving and shipping stores.

Bureau of Ordnance.—Guarding Government property at ordnance dock and naval magazine; overhauling, cleaning, and repairing stores, small arms, &c., turned in from vessels; cleaning and repairing 8-inch M. L. R. long Butler shell returned by U. S. S. Trenton; repairing ordnance lighter; preparing ammunition and stores for U. S. S. Galena; preparing and delivering stores to U. S. S. Alliance; preparing stores and equipments for U. S. S. Jamestown and Powhatan; repairing chocking quoins for issue; attendance upon steam boilers and engine, heating buildings, and running machine tools.

Bureau of Construction and Repair.—General repairs to U. S. S. Galena; general repairs to U. S. S. Yantic; altering U. S. torpedo-boat Intrepid into a light-draught gunboat, removing joiner-work, &c.; repairs and alterations to U. S. S. Vermont to prepare her for use as receiving-ship; general repairs contingent upon putting new boilers into the U. S. S. Cohasset; repairs necessary to putting new boiler into U. S. S. Nina, and to fit Mr. J. J. Kunstadter's patent screw-steering apparatus to this vessel for trial; fitting new mast, &c., for U. S. S. Saratoga; repairing transom cushions for U. S. S. Tennessee; repairing whale-boat of the monitor Miantonomoh; repairing U. S. S. Vandalia's boat; turning composition knobs for U. S. S. Alliance's rail; general miscellaneous work in preparing articles for shipment, receiving and caring for stores, attendance upon boilers and engines, making patterns, sawing plank-stock, handling timber and lumber, digging for steam-pipe in street, repairing tools, getting out and preparing launching ways to haul out U. S. S. Intrepid, transporting coal and other materials, watching and cleaning ships in ordinary and undergoing repairs, and general laboring work of department.

Bureau of Steam Engineering.—General repairs to engine departments of U. S. S. Nina, U. S. S. Yantic, U. S. S. Galena, U. S. S. Cohasset; general repairs to engine of U. S. S. Vermont's scow; running engine of U. S. tug Catalpa; cleaning machinery of U. S. monitor Miantonomoh; repairs to machinery of U. S. S. Alliance; making crank-shaft brasses for U. S. S. Vandalia; repairs to tools belonging to the department; handling stores received and to be shipped; repairs to and running different engines in the department and care of steam derrick; attendance upon boilers and general laboring work incidental to the prosecution of work.

Bureau of Provisions and Clothing.—Cutting, manufacturing, inspecting, and baling clothing; receiving, inspecting, delivering, &c., provisions, &c.; roasting, grinding, packing, &c., coffee for shipment; overhauling and repacking stores received from Villefranche, France; overhauling, repacking, &c., beef and pork, and the general duties pertaining to the inspection.

Bureau of Medicine and Surgery.—Receiving, preparing for shipment, and shipping medical stores and appliances for the service; the care and attendance upon the sick; care of public grounds and buildings.

General.—The general routine clerical work incident to the transaction of public business in the several departments of the yard.

LEAGUE ISLAND.

I.

List of the commissioned and warranted officers of the Navy and Marine Corps on shore duty at this station on the 16th November, 1883, including receiving ship and Navy pay office.

Name.	Rank.	Memorandum of the duty on which they are severally engaged.
Edward Simpson	Commodore	Commandant of navy-yard.
William E. Fitzhugh	Captain	Captain of the yard.
Byron Wilson	do	Commanding naval rendezvous, Philadelphia.
R. M. Bartleman	Chief engineer	In charge of department of steam engineering.
M. Bradley	Medical inspector	In charge of department of medicine and surgery.
Silas W. Terry	Commander	In charge of ordnance, navigation, and equipment departments.
Philip Hichborn	Naval constructor	In charge of department of construction and repair.
M. T. Endicott	Civil engineer	In charge of department of yards and docks.
W. G. Buehler	Chief engineer	Superintending construction of machinery of Terror.
George W. Melville	do	In charge of stores, steam-engineering department.
Cipriano Andrade	do	Inspector of coal, Philadelphia.
A. D. Bache	Paymaster	Inspector of provisions and clothing.
H. T. Skelding	do	Paymaster of the yard.
John McGowan, jr.	Lieutenant-commander	Naval rendezvous, Philadelphia.
A. C. Engard	Passed assistant engineer ..	Do.
George A. Bicknell	Lieutenant	Assistant to ordnance, navigation, and equipment officer.
Joseph P. Mickley	Passed assistant engineer ..	Assistant to engineer in charge of stores, in steam-engineering department.
Francis M. Ashton	do	In charge of machinery of iron-clads.
Howard Wells	Passed assistant surgeon ..	Naval rendezvous, Philadelphia.
Robert H. Cross	Gunner	Naval magazine, Fort Mifflin, Philadelphia.
John Macfarlane	Carpenter	Yards and docks department.
William Cuddy	Sailmaker	Equipment and recruiting department.
Thomas W. Bonsall	Mate	Do.
S. T. C. Smith	do	Assistant, executive duty.
T. Y. Field	Colonel	Commanding Marine barracks.
R. S. Collum	Captain	In charge of clothing, &c., and performing general duties.
William Wallace	do	Sick-leave.
H. G. Ellsworth	First lieutenant	Performing general duty.
P. St. C. Murphy	do	Temporarily absent as judge-advocate of general court-martial.
W. E. Fitzhugh	Captain	Commanding receiving ship St. Louis.
C. A. McDaniel	Paymaster	Paymaster of receiving ship St. Louis.
C. A. Schetky	Lieutenant-commander	Executive officer receiving ship St. Louis.
A. F. Price	Surgeon	Surgeon of receiving ship St. Louis.
William Kilburn	Lieutenant	Assistant to executive officer receiving ship St. Louis.
Thomas A. Gill	Chaplain	Chaplain of receiving ship St. Louis.
A. A. Austin	Passed assistant surgeon ..	Assistant to surgeon of receiving ship St. Louis.
George W. Davis	Carpenter	Watch officer receiving ship St. Louis.
Charles H. Jones	Sail-maker	Do.
Frank Watson	do	Do.
Frank Haller	Mate	Do.
Charles H. Thorne	do	Do.
Woodward Carter	Boatswain	In charge of tug Pilgrim and general yard duty.
A. W. Russell	Pay director	Purchasing paymaster.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps at navy-yard, League Island, November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
Marine barracks			9	66	75
United States receiving ship St. Louis ..	20	42	5	12	79
Sick in hospital	1	2	2	5	10
Total	21	44	16	83	164

III.

List of all the civil employés, including foremen and all persons not ordinary mechanics or workingmen, at the navy-yard, League Island, Pa., November 16, 1883.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
COMMANDANT'S OFFICE.				
W. J. Manning.....	First clerk to commandant..	<i>Per an.</i> \$1, 500	Pay, miscellaneous.....	\$4 11
James Davenport.....	Second clerk to commandant.	1, 200	do	3 28
PROVISIONS AND CLOTHING.				7 39
James S. Alexander....	Pay clerk of yard	1, 600 00	Pay, miscellaneous.....	4 38
John Wallace.....	Pay clerk of St. Louis.....	1, 600 00	do	4 38
James A. Pentz.....	Clerk at inspection provisions and clothing.	1, 600 00	do	4 38
S. S. Corey	Pay yeoman	750 00	Pay of the Navy.....	2 05
John Early	Writer, paymaster's office.	1, 017 25	Civil establishment.....	3 31
Joseph Haws	Receiver provisions and clothing.	<i>Per diem.</i> 3 00	Provisions	3 00
ORDNANCE.				21 50
H. H. K. Elliott	Storekeeper	3 00	Ordnance	3 00
John Sullivan.....	Leading-man of riggers and laborers.	3 24	do	3 24
EQUIPMENT AND RECRUITING.				6 24
William M. Palmer ...	Clerk of department	<i>Per an.</i> 1, 200 00	Civil establishment.....	3 29
Edward Chambers.....	Leading rigger.....	<i>Per diem.</i> 3 24	Equipment of vessels	3 24
George Flomerfelt.....	Leading sail-maker.....	3 24	do	3 24
Charles Fisher.....	Shipkeeper	2 00	do	2 00
William Godbey	do	2 00	do	2 00
James Oliver	do	2 00	do	2 00
Henry Myers	Writer at rendezvous.....	3 00	Transportation and recruiting.	3 00
John Lowrie.....	Messenger at rendezvous ...	1 88	do	1 88
YARDS AND DOCKS.				20 65
James S. Mitchell.....	Clerk of department	<i>Per an.</i> 1, 400 00	Civil establishment.....	3 83
Henry C. Redfield	Store clerk.....	1, 300 00	do	3 56
Thomas E. Berger	Writer.....	<i>Per diem.</i> 3 32	Closed navy-yards and stations.	3 32
Richard Bates	Mail messenger.....	1 91	do	1 91
R. H. O'Donnel.....	Messenger and telegraph operator.	3 00	do	3 00
Harry Davenport	Messenger commandant's office.	2 00	do	2 00
Henry Lee	Foreman laborer.....	4 50	do	4 50
Thomas Wilson.....	Watchman	2 00	do	2 00
H. W. Mitchell.....	do	2 00	do	2 00
CONSTRUCTION AND REPAIR.				26 12
William C. Besseleivre.	Clerk of department	<i>Per an.</i> 1, 400 00	Civil establishment	3 83
Sylvester E. Wilson....	Store clerk.....	1, 300 00	do	3 56
Nathan Hilborn	Writer.....	<i>Per diem.</i> 3 31	Construction and repair	3 31
Jacob M. Davis	do	3 31	do	3 56
John H. Davidson.....	Draughtsman	5 00	Steel cruisers.....	5 00
Frank B. King	do	4 00	Construction and repair	4 00
Charles W. Boggs.....	Assistant inspector	3 00	Steel cruisers.....	3 00
Henry Scott	Copyist	3 25	do	3 25
Clement Keen	Inspector of timber.....	4 50	Construction and repair	4 50
William Haight.....	Receiver and deliverer.....	2 75	do	2 75
Sidney J. Besseleivre..	Writer	3 31	Steel cruisers.....	3 31
James Spear	Master carpenter	5 50	Construction and repair	5 50
Andrew J. Keyser	Master joiner	5 00	do	5 00
John M. Davis	Master iron-plater	5 00	do	5 00
Andrew B. Doebler	Master plumber	5 00	do	5 00
Amos. J. Palmer	Master painter	5 00	do	5 00
Jacob K. Pitcher	Master boatbuilder	5 00	do	5 00
Charles H. Gray	Master calker.....	5 00	do	5 00
John Virden.....	Master spar-maker.....	5 00	do	5 00
George Land	Quartermen shipsmith in charge.	4 02	do	4 02

List of civil employés, including foremen and all persons, &c.—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
CONSTRUCTION AND REPAIR—continued.				
John W. Ford	Quarterman laborer in charge.	\$2 76	Construction and repair.....	\$2 76
Gilbert Horn	Quarterman shipwright.....	4 02	do	4 02
Gilbert Wright	Quarterman shipwright	4 02	do	4 02
Daniel Mahorn	In charge of shipkeepers	3 00	do	3 00
Henry Logan	In charge of pattern-shop	3 50	do	3 50
Henry Bennett	In charge of mold-loft floor	3 76	do	3 76
Edward Weaver	In charge of saw-mill	3 50	do	3 50
Daniel Chatten	Leading-man of joiners	3 24	do	3 24
Samuel Steward	do	3 24	do	3 24
				115 38
STEAM ENGINEERING.				
Henry M. Vallette.....	Clerk of department.....	<i>Per an.</i> 1,200 00	Civil establishment	3 29
John M. Curtis	Store clerk	<i>Per diem.</i> 3 66	Steam machinery	3 66
Aug. O. Bostrom	Draughtsman	5 00	do	5 00
John Rowbotham	Foreman machinist	5 95	do	5 95
Hugh Caskey	Foreman founder	4 50	do	4 50
William Hughes	Quarterman machinist.....	3 50	do	3 50
William Palmer	do	3 50	do	3 50
John Maneely	Leading-man pattern-maker.	3 24	do	3 24
William Stowe	Leading-man boiler-maker..	3 24	do	3 24
Samuel Spearing	Leading-man coppersmith ..	3 24	do	3 24
				39 12
MEDICINE AND SURGERY.				
C. C. Smith	Apothecary	<i>Per an.</i> 750 00	Pay of Navy	2 05
NAVY PAY OFFICE, PHILADELPHIA.				
E. S. Hall	Chief clerk	2,000 00	Contingent Navy	5 48
A. Gaw	Clerk	1,400 00	do	3 84
T. J. Rice	Clerk	1,200 00	do	3 29
S. S. Drennon	Messenger	650 00	do	1 78
				14 39

IV.

Statement of the number of mechanics, laborers, &c., employed at the United States navy-yard, League Island, Pa., on November 16, 1883.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF PROVISIONS AND CLOTHING.		
Cooper	1	\$3 00
Store laborers	3	6 00
Laborer	1	2 00
BUREAU OF ORDNANCE.		
	5	11 00
Carpenter	1	3 00
Riggers, second class	3	7 50
Laborers, first class	5	9 00
Laborer, second class	1	1 50
BUREAU OF EQUIPMENT AND RECRUITING.		
	10	21 00
Sail makers	10	30 00
Riggers	7	20 40
Special laborer in storehouse	1	2 50
Laborer (detailed)	1	2 00
Laborers (riggers, second class)	3	6 30
	22	61 20

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day, in each class.
BUREAU OF NAVIGATION.		
Laborer (storehouse)	1	\$2 00
BUREAU OF YARDS AND DOCKS.		
Engineers, fourth class	4	8 80
Special laborer, first class	1	2 50
Dike laborers, first class	3	6 00
Laborers, first class	10	18 00
Stable-keeper, third class	1	2 00
Hostler, first class	1	2 00
Horse teamsters, first class	3	6 00
	23	45 30
BUREAU OF CONSTRUCTION AND REPAIR.		
Shipwrights (2 apprentices and 2 minors)	52	161 76
Fasteners	9	20 70
Millmen	5	14 96
Joiners (2 apprentices)	45	131 55
Cabinet-maker	1	3 00
Upholsterer	1	3 00
Pattern-makers (1 apprentice)	4	9 90
Shipsmiths (2 apprentices)	13	41 26
Shipsmiths' helpers	13	28 60
Iron-platers (1 apprentice, 1 minor)	17	46 80
Engineers	3	9 00
Firemen	4	9 20
Spar-makers (1 apprentice)	3	7 80
Boatbuilders (1 apprentice, 1 minor)	11	29 25
Block-makers	3	9 00
Cooper	1	3 00
Painters (2 apprentices)	24	69 00
Plumbers (3 apprentices)	8	19 72
Coppersmith	1	3 00
Tinners	2	6 00
Galvanizer	1	3 00
Calkers	9	29 34
Spinners	2	4 40
Toolkeeper	1	2 50
Water-boy	1	1 00
Rigger laborer	1	2 40
Storehouse laborers	4	9 00
Skilled laborers	18	38 80
Laborers	34	67 40
Messenger	1	2 00
Shipkeepers	12	24 00
	304	810 34
BUREAU OF STEAM ENGINEERING.		
Machinists (3 apprentices)	50	140 00
Molders (1 apprentice)	10	25 80
Pattern-makers	2	5 70
Carpenter	1	3 00
Coppersmiths	4	12 00
Boiler-makers	9	27 00
Flange-turner	1	3 50
Blacksmiths	4	12 00
Engine-tenders	2	6 00
Fireman	1	2 30
Brick-mason	1	3 50
Painter	1	2 70
Riggers	2	5 40
Storehouse laborer (special)	1	2 50
Storehouse laborer	1	2 00
Helpers	49	98 80
Messenger	1	1 75
	140	353 95
BUREAU OF MEDICINE AND SURGERY.		
Scrubber	1	33

V.

Statement of all the work being performed at the League Island navy-yard on November 16, 1883.

Bureau of Provisions and Clothing.—Performing the necessary clerical duties, getting stores ready for issue to the U. S. S. Ossipee, and attending to fires, messages, &c.

Bureau of Ordnance.—Performing clerical work, repairing shell boxes, fitting breechings, placing shell and shrapnel on lighter, care of magazine grounds, &c., at the naval magazine, Fort Mifflin, and miscellaneous laboring work.

Bureau of Equipment and Recruiting.—Performing clerical duty in equipment office, clerical and miscellaneous duty at naval rendezvous, Philadelphia, working on quarter-deck awning, poop-deck awning, whale-boats' cushions, floor covers, hammocks, clothes-bags, and rigging of the U. S. S. Ossipee.

Bureau of Navigation.—Performing general work in storehouse, and preparing stores for outfit of U. S. S. Ossipee.

Bureau of Yards and Docks.—Superintendence, messenger duty in commandant's office, clerical and messenger duty, &c., in civil engineer's office and store; attendance steam and fire engines, driving horses, oxen, &c., and care of same; attendance on tug; repairing dikes and cleaning yard, and care of buildings.

Bureau of Construction and Repair.—Necessary work in all branches for the completion of repairs to the U. S. S. Ossipee by January 1, 1884, and fitting that vessel for sea in all respects; assisting in the preparation of plans of new steel cruisers; assisting in the inspection of materials for same, and care and preservation of monitors Jason, Nahant, and Montauk.

Bureau of Steam Engineering.—Overhauling and repairing machinery, placing boilers, making smoke-pipe, &c., for U. S. S. Ossipee; preservation of machinery afloat, &c.

Bureau of Medicine and Surgery.—Taking care of and cleaning dispensary.

WASHINGTON.

I.

List of commissioned or warranted officers of the Navy and Marine Corps on shore duty at the naval station, Washington, D. C., November 16, 1883.

Names.	Rank.	Duties.
Alexander A. Semmes...	Commodore.....	Commandant of the yard and station.
James A. Greer.....	Captain.....	Captain of the yard and station.
John A. Howell.....	Commander.....	Inspector of ordnance, and in charge of department of ordnance.
Silas Casey.....	do.....	In charge of department of equipment and recruiting.
Yates Stirling.....	do.....	In charge of department of navigation.
Marcus B. Buford.....	Lieutenant-commander...	Assistant to equipment officer.
James H. Dayton.....	Lieutenant.....	Assistant to inspector of ordnance, supervision of laboratory, hydraulic press, manufacture of rockets, patterns, &c.
Frank Courtis.....	do.....	Equipment and recruiting department.
W. W. Reisinger.....	do.....	In charge of Bellevue magazine.
William L. Moore.....	do.....	Under instructions in ordnance.
Kossuth Niles.....	do.....	In charge of special experimental work, tests of metals, and manufacture of steel breech-loading guns.

List of commissioned or warranted officers, &c.—Continued.

Names.	Rank.	Duties.
Nathan Sargent.....	Lieutenant	Ordered to equipment, but acting as aide to commandant.
Henry J. Hunt.....	do	Under instructions in ordnance.
Samuel F. Lomax	Mate	In charge of fire-tug Rescue.
John A. H. Willmuth.....	do	Various duties such as are assigned to him from time to time by commandant and captain of yard.
Henry C. Nelson.....	Medical inspector.....	Medical officer of yard, and in charge of yard dispensary.
Adolph A. Hoehling	Surgeon	In charge of naval dispensary, corner of Eighteenth and G streets northwest.
James H. Gaines.....	Passed assistant surgeon..	In charge of naval hospital.
Avery C. H. Russell.....	do	Assistant to medical officer of the yard.
Thomas H. Looker.....	Pay director	Purchasing pay officer for the yard and station.
Frank C. Cosby.....	Pay inspector.....	Inspector of provisions and clothing, and in charge of department of provisions and clothing.
James Hoy	do	In charge of pay accounts of officers, &c., on station roll, and of mechanics, laborers, &c., employed in yard.
Alexander Henderson ...	Chief engineer.....	Chief engineer of yard, and in charge of department of steam engineering.
David Smith.....	do	Assistant to chief engineer, and in charge of steam-engineering storehouse.
George W. Roche.....	Passed assistant engineer.	Assistant to chief engineer, member of board of inspection, &c.
Samuel H. Pook.....	Naval constructor	Naval constructor of yard, and in charge of department of construction and repair.
A. G. Menocal	Civil engineer	Civil engineer of yard, and in charge of department of yards and docks.
Charles E. Hawkins.....	Boatswain	In charge of riggers, equipment department.
Xavier Perrimond.....	do	Assistant to boatswain in charge.
Charles H. Venable.....	Gunner.....	In charge of storerooms and work in gunner's division of ordnance department.
Samuel Cross.....	do	In charge of outside labor, such as transportation of guns and carriages, preservation of guns and projectiles.
Henry W. Frankland ...	Sailmaker	In charge of outside labor in equipment department.
Richard P. Leary	Commander	Commanding United States receiving vessel Wyandotte.
Charles M. McCarteney..	Lieutenant	Executive officer of the United States receiving vessel Wyandotte.
Remus C. Persons.....	Passed assistant surgeon.	Medical officer of the United States receiving vessels Wyandotte and Speedwell.
Jacob D. Doyle	Assistant paymaster.....	Pay officer of the United States receiving vessels Wyandotte and Speedwell.
William A. Cooper.....	Boatswain	United States receiving vessel Wyandotte.
David G. McRitchie	Lieutenant	Commanding United States steamer Speedwell.
John H. Higbee	Captain	Commanding officer of the Marine guard.
Randolph Dickins	Second lieutenant	Marine officer.
Charles H. Lauchheimer	do	Do.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps at naval station, Washington, D. C., November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non commissioned officers.	Enlisted men.	
Marine barracks.....			12	50	62
United States receiving ship Wyandotte	30	26			56
Sick in hospital.....	1	2		3	6
Insane Asylum.....		12			12
Prisoners at barracks.....				2	2
United States tug Speedwell.....	6	17			23
Total.....	37	57	12	55	161

III.

List of all the civil employes, including foremen and all persons not ordinary mechanics or workmen, at the naval station, Washington, D. C., November 16, 1883.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
George W. Watson	1st clerk to commandant....	\$1,500 00	Pay, miscellaneous	\$4 11
Bordley F. Colhoun	2d clerk to commandant....	1,200 00	do.....	3 29
YARDS AND DOCKS.				
John T. Strattan	Clerk of department.....	1,400 00	Civil establishment	3 84
Arnold Cleaves	Store clerk	1,300 00	do.....	3 56
J. B. Chapman	Special hand		General maintenance.....	2 50
Charles F. Watson.....	Mail messenger.....		do.....	2 50
Andrew Neville	Special quarterman.....		do.....	4 00
Henry Craig	Bell ringer		do.....	1 76
William H. Grimshaw ..	Messenger and laborer.....		do.....	2 00
Henry J. Bright.....	Telephone operator.....		do.....	1 50
James Sephus	Messenger and laborer.....		do.....	1 76
James T. Callan.....	Captain of the watch.....		do.....	2 76
Dennis Kenney	Watchman		do.....	2 00
Edward Sweeny	do		do.....	2 00
John P. Cohill	do		do.....	2 00
Jared Mundell.....	do		do.....	2 00
William T. Meyers.....	do		do.....	2 00
L. W. Sanderson.....	do		do.....	2 00
Peter Berry.....	Watchman on dredger		Navy-yard Washington, dredging channel.	1 00
EQUIPMENT AND RE- CRUITING.				46 58
Hamilton K. Gray	Clerk of department.....	1,400 00	Civil establishment.....	3 84
Francis Wood	Writer.....		Equipment of vessels.....	4 22
James W. Flood.....	do		do.....	3 30
A. W. Dangerfield.....	Messenger.....		do.....	2 00
William L. Cowan	Foreman of sail-makers		do.....	5 00
R. M. Green.....	Foreman of smith and chain shop.		do.....	5 00
William Young.....	Foreman of galley-makers ..		do.....	6 00
James Wilson	Superintendent of forge and anchor shop.		do.....	5 00
NAVIGATION.				34 36
John H. King	Special store hand.....		Navigation.....	2 00
ORDNANCE.				
Joseph Brummett	Clerk of department.....	1,500 00	Civil establishment.....	4 11
James B. Davis.....	Foreman		Ordnance	6 00
Samuel Miller	Quarterman		do.....	4 00
Edward T. Tippet.....	Draughtsman.....		do.....	4 00
Leon E. Dessez	Draughtsman (temporarily employed).		do.....	3 00
Henry Stewart	Storekeeper		do.....	3 00
Hamilton Cook	Ordnance man.....		do.....	2 76
CONSTRUCTION AND RE- PAIR.				26 87
William P. Allan	Clerk of department	1,400 00	Civil establishment	3 84
G. P. Frothingham.....	Draughtsman.....		Construction and repair	5 00
F. E. Grice	do		do.....	5 00
C. R. Hanscom.....	Draughtsman at Naval Ad- visory Board.		Steel cruisers	5 00
Charles Hemje	do		do.....	4 00
J. M. Hargan	do		do.....	4 00
M. M. Thomas	Writer.....		Construction and repair	3 31
C. T. Miller	do		do.....	3 31
Matthew McNelly.....	Superintendent copper-roll- ing mill.		do.....	5 00
Frank W. Cross.....	Quarterman of iron-platers ..		do.....	4 00
James M. Clark.....	Engineer in charge of en- gines and boilers.		do.....	4 00
B. L. Simpson	Leading-man, joiners.....		do.....	3 18
James McKenzie	Messenger		do.....	1 76
H. R. Maloney	Store laborer.....		do.....	2 00
G. A. Williams.....	Shipkeeper		do.....	2 00
John Hickey	do		do.....	2 00
Patrick Doolan	do		do.....	2 00
				59 40

List of all the civil employes, including foremen and all persons, &c.—Continued.

Names.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
STEAM ENGINEERING.				
James P. Wilson.....	Clerk of department	\$1,300 00	Civil establishment	\$3 56
John Schultze	Store clerk		Steam machinery	3 56
John A. Svedberg.....	Draughtsman		do	5 25
Albr. Becker.....	Draughtsman at Naval Advisory Board.		do	5 00
George R. Wilson.....	Superintendent of machinery		do	6 50
Isaac McKane Chase ..	Foreman of pattern-makers		do	5 25
Samuel Gelston.....	Foreman of iron foundry		do	5 25
William Bennett.....	Foreman of boiler-makers		do	5 25
George F. Waters.....	Leading-man of machinists		do	3 00
Thomas Clifford	Messenger		do	2 00
PROVISIONS AND CLOTHING.				44 62
Joseph S. Stimson.....	Clerk of department	1,600 00	Pay, miscellaneous	4 38
Joseph Bury	Weigher		Provisions	2 50
George S. Sproston.....	Clerk to yard paymaster	1,600 00	Pay, miscellaneous	4 38
John G. Meyers.....	Clerk to paymaster of the receiving ship.	1,300 00	do	3 56
Francis Barry.....	Writer in pay office	1,300 00	Contingent, Navy	3 56
George S. Clendaniel...	do	1,300 00	Civil establishment	3 56
Richard V. Barry	Paymaster's yeoman	750 00	Pay of the Navy	2 05
MEDICINE AND SURGERY.				23 99
W. B. Reynolds.....	Apothecary, naval hospital.	\$750 00	Pay of the Navy	\$2 05
James Butler	Engineer, naval hospital		Civil establishment, M. & S.	59
Mary Dolan	Cook, naval hospital		do	46
Ellen Thompson.....	Laundress, naval hospital		do	30
Charles A. Magruder..	Mess-room attendant, naval hospital.		do	42
George A. Thompson..	Chief nurse, naval hospital		do	52
William Hitte	Assistant nurse, naval hospital.		do	39
Charles Parks	Scrubber, naval hospital		do	29
J. V. Thorp	Apothecary, yard dispensary.	750 00	Pay of the Navy	2 05
H. A. Turner	Laborer, yard dispensary		Civil establishment, M. & S.	2 00
George Johnson	Scrubber, yard dispensary		do	33
NAVY PAY OFFICE.				9 40
F. V. Walker.....	Chief clerk	2,000 00	Contingent, Navy	5 48
John C. Brigham	Clerk	1,800 00	do	4 93
George W. Bagg	do	1,600 00	do	4 38
F. L. Stickney	do	1,000 00	do	2 74
J. D. B. Littell	do	900 00	do	2 47
George Matthews.....	Messenger		do	1 78
				21 78

IV.

Statement of the number of mechanics, laborers, &c., employed at the United States naval station, Washington, D. C., November 16, 1883.

Rate.	Number.	Total of the pay-roll for each class.
BUREAU OF YARDS AND DOCKS.		
Joiners	5	\$14 04
Wheelwright	1	2 76
Steam and gas fitter	1	3 14
Tinner	1	2 26
Pavers	4	8 40
Painter (1 apprentice)	2	3 50
Helpers	3	4 80
Laborers	17	23 38

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for each class.
Boys	5	\$2 50
Machinist	1	2 50
Rodman	1	2 00
Engineer	1	3 00
Dredger	1	2 00
Fireman	1	1 50
Fire-apparatus men	3	6 78
Stable-keepers	2	3 00
Teamsters	6	9 00
	55	94 56
BUREAU OF EQUIPMENT AND RECRUITING.		
Anchor-smiths	4	11 28
Iron-roller	1	2 76
Engine-tender	1	2 26
Fireman	1	1 50
Brass and iron finishers	2	5 52
Blacksmiths	7	18 80
Galley-makers	3	7 52
Coppersmith	1	3 00
Pattern-maker	1	3 00
Joiner	1	2 76
Painter	1	2 50
Sail-makers	13	36 36
Rigger	1	3 00
Helpers	15	23 40
Laborers	18	28 08
Boys	2	1 75
Apprentices	5	7 56
	77	161 05
BUREAU OF NAVIGATION.		
Laborer	1	1 22
BUREAU OF ORDNANCE.		
Brass and iron finishers	48	114 26
Loam-molder	1	3 00
Brass and iron molders	9	2 30
Blacksmiths	4	10 78
Brick-mason	1	3 60
Joiners	9	25 58
Pattern-makers	4	10 13
Laboratories	5	11 26
Leather-workers	2	5 52
Ordnance men	8	18 03
Engine-tender	1	2 54
Fireman	1	1 88
Helpers	20	31 40
Attendant (office laborer)	1	2 00
Laborers	6	7 92
Watchmen (Bellevue magazine)	2	5 63
Boys	4	2 00
	126	274 83
BUREAU OF CONSTRUCTION AND REPAIR.		
Shipwrights	3	8 28
Painter	1	2 50
Cooper	1	2 50
Ship-joiners (3 apprentices)	12	29 21
Model-makers	2	6 52
Iron-platers (2 apprentices)	8	18 30
Molders	2	5 52
Boy	2	1 76
Shipsmiths	2	5 26
Helpers	2	3 20
Laborers	18	31 48
Engine-tender	1	2 26
Firemen	4	6 00
Copper-rollers	10	26 30
Copper-catchers	8	17 30
	76	166 48

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for each class.
BUREAU OF STEAM ENGINEERING.		
Machinists.....	27	\$68 86
Pattern-makers.....	3	8 50
Flange-turners.....	7	19 78
Boiler-makers.....	26	61 86
Blacksmiths.....	3	8 28
Coppersmiths.....	2	5 50
Molders.....	4	11 02
Core-maker.....	1	1 76
Engine-tender.....	1	2 26
Helpers.....	43	64 20
Laborers.....	6	8 64
Rivet-heaters.....	9	7 32
Apprentices.....	15	11 91
	147	279 89
BUREAU OF PROVISIONS AND CLOTHING.		
Cooper.....	1	3 00
Laborers.....	2	4 00
	3	7 00

V.

Statement of all the work being performed at the naval station, Washington, D. C., November 16, 1883.

Bureau of Equipment and Recruiting.—Manufacturing sails for U. S. S. Ossipee, and making boat-covers for U. S. S. Tallapoosa; manufacturing chain cables and outfits for U. S. S. Ossipee; chain cables for general issue; boat chain for Kittery navy-yard; 1½-inch experimental steel chain; making and repairing tools for shop use, and smith work for “yards and docks”; manufacturing “Young’s” improved range No. 7; No. 5 galley for general issue; galley castings and cooking utensils for U. S. S. Marion, and cases for records for Bureau Equipment and Recruiting; manufacturing iron for chain cables; plate iron for the manufacture of galleys; testing and making experiments with steel and iron, and attending engine and boilers; blacking chain; discharging equipment stores from U. S. S. Tallapoosa; handling old rigging and canvas, and cleaning up shops; routine clerical work; receiving and issuing stores; and services of messenger in office and store.

Bureau of Ordnance.—Manufactures: Boat carriages for 3-inch B. L. howitzers; 6-inch breech-loading rifled guns; Gatling gun tripod mounts; pressure gauges; hydraulic cylinders and other fittings for the U. S. S. Trenton’s gun carriages; projectiles for 6-inch breech-loading rifled guns; vent-sealing electric primers; sights for 8 inch M. L. rifles; shell loaders; test specimens of metal for Naval Academy; gun carriages for the U. S. Revenue Service; igniters for rifle time and boxer fuses; magazines for percussion fuses; gun lathes; projectiles for 3-inch breech-loading howitzers; tools; chain studs; castings for U. S. S. Marion’s galley; signal dischargers; castings for hammer faces; packing boxes; toggles for lock lanyards; gun carriages for 6-inch breech-loading rifle guns; practice wands; Navy and rifle time-fuses; quill friction-primers; cartridge bags for 3-inch breech-loading howitzers; passing-boxes for 8-inch M. L. rifles; magazine shoes. Repairs: VIII-inch iron Marsilly carriages; extending laths; star gauges; crucible

furnaces; pulling dinky; office cases. Miscellaneous: Superintending; running engines; sweeping shop; testing wire-laying machine; testing metals; attending store rooms, museum, and offices; cleaning guns and carriages; preparing stores for shipment; receiving and storing material; draughting and routine clerical work in offices.

Bureau of Construction and Repair.—Boat-chocks for steamer Speedwell; deck-buckets; painting commandant's barge; attending engines and boilers; measuring white-pine boards; taking down machinery for shipment to the navy-yard, New York; unloading freight from steamer Tallapoosa; air-pumps for the Bureau of Medicine and Surgery; capstans and cable compressors; cases for the drawing-room at the Bureau of Construction; freight derrick for the Tallapoosa; brass-work for models of new steel cruisers; rolling sheet and bolt copper and sheet-lead.

Bureau of Steam Engineering.—Ten water-gauges for steamer Galena; 10 water-gauges for steamer Marion; repairing machinery steamer Speedwell; repairing machinery steamer Despatch; grate-bars for Marion's boilers; valves, &c., for steamer Alliance; valves, &c., for steamer Vandalia; valves, &c., for steamer Marion; boilers for steamer New York.

NORFOLK.

I.

List of the commissioned and warranted officers of the Navy and Marine Corps on shore duty at the navy-yard, Norfolk, Va., on November 16, 1883.

Name.	Rank.	Occupation.
William K. Mayo.....	Commodore.....	Commanding station.
Geo. E. Belknap.....	Captain.....	Witness before court-martial, Washington, D. C.
L. L. Martin.....	Carpenter.....	Witness to pay-rolls.
C. M. Schoonmaker.....	Commander.....	Navigation and equipment officer, acting captain of yard, and temporary charge of yards and docks.
W. W. Carter.....	Gunner.....	Ordnance duty at navy-yard, Saint Helena and Fort Norfolk.
Patrick Lynch.....	do.....	Charge of magazine, Craney Island.
P. H. Smith.....	Boatswain.....	Charge of rigging loft.
Geo. P. Barnes.....	Sailmaker.....	Expert in inspecting open purchases.
J. McManus.....	Mate.....	Weighing and receiving coal.
B. H. Kidder.....	Surgeon.....	Charge of medical department and patients.
P. C. Asserson.....	Civil engineer.....	Witness before court-martial, Washington, D. C.
Edward May.....	Pay inspector.....	Inspector of provisions and clothing.
L. A. Trailey.....	Paymaster.....	Paying navy-yard employés.
Thom Williamson.....	Chief engineer.....	On trial by court-martial, Washington, D. C.
J. A. B. Smith.....	Passed assistant engineer.....	Superintending department of steam engineering.
A. B. Willits.....	do.....	Assisting engineer in charge of department.
W. H. Varney.....	Naval constructor.....	Charge of department of construction and repair.
C. P. Wallach.....	Pay director.....	Purchasing and disbursing agent.
J. A. Chesley.....	Lieutenant.....	Commanding iron-clads, City Point, Va.
H. Aulick.....	Passed assistant surgeon.....	Medical officer, iron-clads.
H. C. Baughman.....	Assistant engineer.....	Charge machinery, iron-clads.
R. T. M. Ball.....	Assistant paymaster.....	Pay officer, iron-clads.
John Y. Taylor.....	Medical director.....	In charge of naval hospital.
W. G. Farwell.....	Surgeon.....	Medical duty at naval hospital.
R. Swan.....	Passed assistant surgeon.....	Do.
Robert Whiting.....	do.....	On leave of absence.
L. A. Beardslee.....	Captain.....	Commanding receiving ship Franklin.
C. H. Rockwell.....	Lieutenant-commander.....	Executive officer, Franklin.
Isaac I. Yates.....	Lieutenant.....	Navigation and watch officer, Franklin.

List of the commissioned and warranted officers of the Navy, &c.—Continued.

Name.	Rank.	Occupation.
DeWitt Coffman.	Ensign	Relief to watch officer, Franklin.
D. A. Smith	Paymaster.....	Performing duties of pay officer, Frank- lin.
William A. Corwin.....	Surgeon	Performing duties of medical officer, receiving ship Franklin.
Harold Neilson	Mate	Tug duty.
Andrew Milne	Boatswain	Watch officer.
A. C. Burroughs	Carpenter	Building hatch houses.
R. W. Huntington.....	Captain	Commanding post.
Richard Wallach	First lieutenant.....	Officer of the day.
R. D. Wainwright	do	For duty as officer of the day.
S. W. Quackenbush	do	On leave.
Jesup Nicholson.....	do	For duty as officer of the day.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps, at the navy-yard, Norfolk, Va., November, 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-com-missioned officers.	Enlisted men.	
Marine barracks			16	44	60
Receiving ship Franklin	61	63	4	17	145
Sick at naval hospital.....	6	12	2	11	31
U. S. S. Ajax, and monitors, City Point, Va	15	35			50
Total.....	82	110	22	72	286

III.

List of all the civil employés, including foremen and all persons not ordinary mechanics or workmen, at the navy-yard, Norfolk, Va., November 16, 1883.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
John J. Campbell	First clerk to commandant	\$1,500 00	Pay, miscellaneous	\$4 11
George H. Curtis	Second clerk to commandant	1,200 00	do	3 29
YARDS AND DOCKS.				
Charles M. Clark	Chief and time clerk.....	1,400 00	Civil establishment.....	3 84
S. B. Kenney	Store clerk	1,300 00	do	2 56
Charles L. Saunders	Writer, civil engineer's office.	1,017 25	do	2 78
J. J. Sawyer	Writer, commandant's office.	3 00	General maintenance	3 00
L. J. Smith	General foreman.....	5 00	Repairs and preservation...	5 00
Nelson Proctor	Foreman of laborers	4 50	do	4 50
John Jasper	Mail messenger.....	2 00	General maintenance	2 00
James Carter	Messenger	2 00	do	2 00
William Bolden.....	do	2 00	do	2 00
Henry Scott	do	2 00	do	2 00
Samuel P. Wigg	Special laborer	2 50	do	2 50
C. P. Butler	do	2 00	do	2 00
William Swartwout.....	Captain of watch	2 76	do	2 76
Charles Shafer.....	do	2 76	do	2 76
William Carr	Watchman	2 00	do	5 00
Samuel Wood	do	2 00	do	2 00
George Proctor	do	2 00	do	2 00
Domingo Lawrence.....	do	2 00	do	2 00
John Simms	do	2 00	do	2 00
Chas. McDonald	do	2 00	do	2 00
Michael Brennan	do	2 00	do	2 00

List of all the civil employes, including foremen, &c.—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
YARDS AND DOCKS—continued.				
Wm. Hughes	Watchman	\$2 00	General maintenance	\$2 00
Wm. Hart	do	2 00	do	2 00
Geo. Cummings	do	2 00	do	2 00
Chas. Briding	do	2 00	do	2 00
Henry Lamar	do	2 00	do	2 00
John Tatem	do	2 00	do	2 00
EQUIPMENT AND RECRUITING.				73 98
I. N. C. Cole	Clerk to equipment officer ..	1, 200 00	Civil establishment	3 29
Geo. A. White	Writer	3 25	Equipment of vessels	3 25
Wm. H. Spooner	Foreman sail-maker	5 00	do	5 00
Littleton Owens	Special laborer	2 76	do	2 76
Peter Jordan	Messenger	2 00	do	2 00
NAVIGATION.				16 30
Jennison Hammond	Clerk to navigation officer ..	1, 200 00	Civil establishment	3 29
ORDNANCE.				
James F. Carr	Writer to ordnance officer ..	1, 200 00	Civil establishment	3 29
James A. McCoy	Ordnance man, special	3 00	Ordnance	3 00
CONSTRUCTION AND REPAIR.				6 29
Jas. H. Robinson	Chief and time clerk	1, 400 00	Civil establishment	3 84
J. J. Buchanan	Store clerk	1, 300 00	do	3 56
B. F. Diggs	Writer	3 31	Construction and repair	3 31
C. M. Murdaugh, jr	do	3 31	do	3 31
Job P. Manning	do	3 31	do	3 31
T. B. Southard	Draughtsman	5 00	do	5 00
W. H. Hartt	Draughtsman, second class ..	4 00	do	4 00
Jno. R. White	Timber inspector	4 50	do	4 50
Wm. M. Jennings	Messenger	2 00	do	2 00
Wm. F. Smith	Master shipwright	5 00	do	5 50
F. J. Durham	Master ship-joiner	5 50	do	5 00
C. B. Lewellyn	Master shipsmith	5 00	do	5 00
F. J. Kilpatrick	Master iron-plater	5 00	do	5 00
Joseph Knapp	Master spar-maker	5 00	do	5 00
R. H. McLean	Master boatbuilder	5 00	do	5 00
J. J. Curran	Master painter	5 00	do	5 00
Geo. W. Fauth	Master plumber	5 00	do	5 00
John Milan	Master calker	5 00	do	5 00
A. J. Hopkins	Engineer in charge	4 00	do	4 00
Edward Wonycott	Receiver and deliverer	2 75	do	2 75
STEAM ENGINEERING.				85 08
Wm. H. Lyons	Superintendent of machinery.	6 49	Steam machinery	6 49
Chas. H. Sturtevant	Clerk to chief engineer	1, 300 00	Civil establishment	3 56
Wm. N. Eaton	Store clerk	3 57	Steam machinery	3 57
Thos. J. Howe	Foreman boiler-maker	5 25	do	5 25
Jas. W. McDonough	Foreman molders	5 00	do	5 00
Geo. Thompson	Quarterman machinist	3 76	do	3 76
James Wilson	Quarterman pattern-maker ..	3 76	do	3 76
Dan'l T. Shea	Special laborer	2 76	do	2 76
Geo. Beatty	do	2 76	do	2 76
Albert Bushnell	do	2 50	do	2 50
William King	do	2 50	do	2 50
Strother Jones	do	2 50	do	2 50
Dan'l Linehan	do	2 50	do	2 50
Robert Conner	Messenger	2 00	do	2 00
Geo. Munden	do	2 00	do	2 00
PROVISIONS AND CLOTHING.				50 91
J. A. Smith	Pay clerk, Franklin	1, 300 00	Pay miscellaneous	3 56
R. R. Ball	Pay clerk, Ajax and monitors	1, 000 00	do	2 74

List of all civil employés, including foremen, &c.—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
PROVISIONS AND CLOTHING—continued.				
C. C. Pearson	Clerk to insp. of Pro. and Clo	\$1,300 00	Pay, miscellaneous	\$3 56
J. A. Denson	Writer at inspection	1,017 25	Civil establishment	2 78
Thos. Hartung	Receiver	3 00	Provisions	3 00
Wm. H. Palmer	Assistant receiver	2 50	do	2 50
I. T. Van Patten	Clerk to paymaster	1,400 00	Pay miscellaneous	3 84
W. R. Butcher	Writer to paymaster	1,071 25	Civil establishment	2 78
Herman Smith	Paymaster's yeoman	750 00	Pay of the Navy	2 05
A. E. Moriarty	Clerk to pur. and disb. agent	1,600 00	Contingent expenses	4 38
Geo. Walker	Writer	1,000 00	do	2 74
Geo. W. Davenport	Messenger	50 00	do	1 67
				35 60
MEDICINE AND SURGERY.				
H. H. Dinning	First-class apothecary, yard	750 00	Pay of the Navy	2 05
Henry Hinton	Scrubber	10 00	Civil establishment	33
J. H. Bellingham	First-class apothecary, hospital	750 00	Pay of the Navy	2 05
Richard S. Barry	do	750 00	do	2 05
Jno. F. Fullerton	Fireman	48 00	Civil establishment	1 60
Nehemiah Atkinson	Chief nurse	20 00	do	67
Chas. McDonald	Ass't nurse	16 00	do	53
James Elliott	Chief cook	20 00	do	67
Henry T. Knight	Ass't cook	16 00	do	53
Frank Yore	Stableman	16 00	do	53
Thos. Keenan	Boatman	16 00	do	53
Henry Lee	Mess-room attendant	16 00	do	53
Mary Council	Laundress	10 00	do	33
Laura Deans	do	10 00	do	33
Catherine Perry	Scrubber	7 00	do	23
				12 96

IV.

Statement of the number of mechanics, laborers, &c., employed at the United States navy-yard, Norfolk, Va., on November 16, 1883.

Rate.	Number.	Total of the pay-roll for the day in each class.
YARDS AND DOCKS.		
Slater	1	\$3 50
Ship-carpenter	1	3 00
Wheelwright	1	3 00
Wharf-builders	8	18 08
House-joiners' apprentice	1	1 26
Painters	4	10 78
Water-carrier	1	76
Engineers, fire-engines	2	6 00
Engineers, dredge	1	2 76
Firemen, dredge and pile-driver	2	3 52
Firemen, fire-engines	2	3 32
Machinists' apprentice	1	1 26
Blacksmith	1	3 00
Blacksmiths' helper	1	1 76
Gas fitter	1	2 50
Harness-maker	1	3 00
Rigger	1	2 50
Store laborers	2	4 52
Pilot of other boat	1	2 26
Laborers	21	31 50
Dredger	1	1 76
Boy	1	1 00
Hostler	1	2 00
Drivers, fire-engines	2	3 52
Teamsters	12	18 00
Total	71	134 56

Statement of the number of mechanics, laborers, &c., employed, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day in each class.
EQUIPMENT AND RECRUITING.		
Rigger	1	\$3 00
Sail-makers' apprentice	1	1 06
Storehouse laborer	1	2 76
Laborers	12	18 26
Total	15	25 08
NAVIGATION.		
Laborer	1	2 00
ORDNANCE.		
Ordnance men	4	8 00
Laborers	2	2 50
Total	6	10 50
CONSTRUCTION AND REPAIR.		
Shipwrights	35	94 28
Mill-sawyers	3	9 50
Fasteners	32	71 93
Saw-filer	1	3 00
Pattern-maker	1	3 50
Rigger	1	3 00
Toolkeeper	1	2 50
Ship-joiners	16	42 90
Shipsmiths	13	29 16
Iron-platers	7	15 40
Engine-tenders	4	12 00
Firemen	6	10 56
Spar-makers	4	9 90
Block-makers	2	3 90
Coopers	3	7 06
Boatbuilders	7	19 50
Painters	4	4 80
Plumbers	5	11 56
Calkers	3	4 26
Helpers	18	39 76
Skilled laborers	3	7 50
Storehouse laborers	3	8 02
Laborers	110	165 76
Total	282	579 75
STEAM ENGINEERING.		
Machinists	18	33 12
Pattern-makers	5	12 66
Boiler-makers	7	16 92
Blacksmiths	3	9 24
Molders	6	12 88
Helpers	14	23 76
Receiver and weigher	1	2 50
Rigger	1	2 76
Engine-tenders	2	6 00
Special hand, store	1	2 50
Rivet-heaters	2	2 00
Firemen	2	3 52
Laborers	17	25 02
Water-boys	5	3 80
Total	84	156 68
PROVISIONS AND CLOTHING.		
Cooper	1	3 00
Laborers	7	12 50
Total	8	15 50
MEDICINE AND SURGERY.		
Laborers at naval hospital	4	1 83

V.

Statement of all the work being performed at the naval station, Norfolk, Va., on or for vessels of war, on November 16, 1883.

Breaking up the U. S. S. Canandaigua; repairing the U. S. S. Dale; constructing six boilers for the U. S. S. Vandalia and six boilers for the U. S. S. Alliance; overhauling gun-carriages of the U. S. S. Dale; and care and preservation of the U. S. receiving ship Franklin, and U. S. monitors Ajax, Catskill, Lehigh, Manhattan, Mahopac, and Canonicus.

PENSACOLA.

I.

List of the commissioned and warrant officers of the Navy and Marine Corps on shore duty at this yard, Pensacola, Fla., on the 16th of November, 1883.

Names.	Rank.	Duty.
William Welch	Lieutenant commander	Commanding yard and equipment officer.
D. M. Guiteras	Passed assistant surgeon	Surgeon of yard and hospital.
Edwin Crissey	Boatswain	Captain of yard and in charge of tug <i>Rose</i> .
C. B. Magruder	Gunner	In charge of ordnance and navigation.
M. T. Quigley	Acting carpenter	Construction duty.
James M. Roche	Acting assistant paymaster	In charge of pay department.
A. S. Taylor	First lieutenant U. S. M. C	Commanding Marine guard.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps a navy-yard, Pensacola, Fla., November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
U. S. tug <i>Rose</i>	5	2	.....	.....	7
Sick in hospital .....	.....	.....	1	1	2
Marine guard .....	.....	.....	7	11	18
Total	5	2	8	12	27

III.

List of all the civil employés, including foremen and all persons not ordinary mechanics or workmen, at navy-yard, Pensacola, Fla., November 16, 1883.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
YARDS AND DOCKS.				
W. J. Wheat	Writer in charge	\$3 00	Civil establishment	\$3 00
J. T. Crona	Captain of watch	2 80	Closed navy-yards and stations.	2 80
CONSTRUCTION AND REPAIR.				5 80
James A. McDonald ...	Master carpenter	5 50	Construction and repair	5 50
E. V. Glover	Writer	3 31	do	3 31
John Ranch	Storehouse laborer	3 25	do	3 25
				12 06

List of all the civil employes, including foremen, &c—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
STEAM ENGINEERING.				
John Purdy.....	Writer in charge	\$3 25	Steam machinery	\$3 25
MEDICINE AND SURGERY.				
Peter Bonifay.....	Apothecary (navy-yard)....	750 00	Pay of the Navy.....	2 06
W. J. Pruden	Apothecary (naval hospital).	750 00	do	2 06
				4 12

IV.

Statement of the number of all other persons employed at navy-yard, Pensacola, November 16, 1883.

Rate.	Number.	Total of the pay roll for the day in each class.
BUREAU YARDS AND DOCKS.		
Painters, second class	5	\$13 30
Engineer, first class	1	3 50
Assistant in charge dry-dock.....	1	3 00
Mail messenger.....	1	2 50
Fireman	1	2 00
Driver fire-engine	1	2 00
Special laborers.....	2	4 00
Watchmen.....	6	12 00
Laborers, first class	3	5 22
Laborers, second class.....	3	4 50
Laborers, fourth class	1	1 00
	25	53 02
CONSTRUCTION AND REPAIR.		
Laborer, first class	1	1 74
Boy.....	1	75
	2	2 49
STEAM ENGINEERING.		
Machinist	1	3 75
Boiler-maker	1	1 75
Laborer, first class	1	1 74
Laborers, second class.....	2	3 00
Apprentice	1	1 12
	6	11 36
PROVISIONS AND CLOTHING.		
Cooper.....	1	3 50
Store laborer.....	1	2 00
Laborers.....	2	2 67
	4	8 17
EQUIPMENT AND RECRUITING.		
Special laborer	1	2 00
Store laborer	1	2 00
Laborer, first class	1	1 74
	3	5 74
ORDNANCE.		
Laborer.....	1	1 60
MEDICINE AND SURGERY.		
Cook.....	1	40
Laborer.....	1	86½
Scrubber.....	1	33½
	3	1 60

V.

Statement of all the work being performed at navy-yard, Pensacola, Fla., November 16, 1883.

Bureau Yard and Docks.—Painting commandant's quarters A and building No. 15. Cleaning and disinfecting buildings, and care and preservation of yard property.

Construction and Repair.—Care and preservation of stores, shops, machinery, and tools, and office duty.

Steam Engineering.—Repairing boiler of commodore's barge; care and preservation of stores, &c.

Provisions and Clothing.—Care and preservation of stores.

Equipment and Recruiting.—Care and preservation of stores.

Ordnance.—Care and preservation of stores.

Medicine and Surgery.—Care of the sick, and routine business of the dispensary.

MARE ISLAND.

I.

List of commissioned and warrant officers of the United States Navy and Marine Corps on shore duty at navy-yard, Mare Island, California, November 16, 1882.

Name.	Rank.	Duty.
John H. Russell.....	Commodore.....	Commandant.
John Irwin.....	Captain.....	Captain of the yard.
James Fulton.....	Pay director.....	Inspector of provisions and clothing.
Casper Schenck.....	do.....	Navy pay agent at San Francisco.
George W. Much.....	Naval constructor.....	In charge department of construction and repair.
George F. Kutz.....	Chief engineer.....	In charge department of steam engineering.
Somerset Robinson....	Medical inspector.....	In charge of naval hospital.
Frederick Rodgers.....	Commander.....	Commanding United States receiving ship Independence.
Louis Kempff.....	do.....	Inspector of ordnance.
Henry Glass.....	do.....	In charge of department of equipment and recruiting.
Walter K. Scofield....	Surgeon.....	In charge of department of medicine and surgery.
J. B. Redfield.....	Paymaster.....	Paymaster of the yard.
H. T. Stancliff.....	do.....	Paymaster of United States receiving ship Independence.
John J. Brice.....	Lieutenant-commander.....	In charge department of navigation.
H. H. Cline.....	Passed assistant engineer...	Assistant in department of steam engineering.
Richard M. Cutts.....	Lieutenant.....	Aid to commandant.
Dwight Dickinson.....	Surgeon.....	Assistant in naval hospital.
Theodore C. Heyl.....	do.....	Surgeon of United States receiving ship Independence.
Chris. C. Wolcott.....	Civil engineer.....	In charge of department of yards and docks.
Frank Guertin.....	Lieutenant.....	Executive officer United States receiving ship Independence.
Joseph Feaster.....	Assistant naval constructor.	Assistant in department of construction and repair.
George M. Stoney.....	Lieutenant.....	Navigator United States receiving ship Independence.
Thomas Savage.....	Boatswain.....	Assistant in equipment department.
Timothy Sheehan.....	do.....	Watch officer United States receiving ship Independence.
George P. Cushman...	Gunner.....	Do.
William Halford.....	do.....	Assistant in ordnance department.
Robert A. Williams...	Carpenter.....	Assistant in department of construction and repair.
Warren Barnard.....	do.....	Watch officer United States receiving ship Independence.
Thomas O. Fassett....	Sailmaker.....	Do.
John Roddy.....	do.....	Do.
William Redstone.....	do.....	Assistant in equipment department.
George W. Collier.....	Major.....	Commanding Marine barracks.
George Barnett.....	Second lieutenant.....	Marine barracks.
Franklin J. Moses.....	do.....	Do.

II.

Statement of the number of petty officers and enlisted men of the Navy and Marine Corps at navy-yard, Mare Island, California, November 16, 1883.

Location of duty.	Navy.		Marine Corps.		Total.
	Petty officers.	Enlisted men.	Non-commissioned officers.	Enlisted men.	
Marine barracks.....			27	97	124
United States receiving ship Independence.....	15	46	5	17	83
Sick in hospital.....		19	2	2	23
Prisoners at barracks.....		4			4
Total.....	15	69	34	116	234

III.

List of all the civil employes, including foremen, and all persons not ordinary mechanics or workingmen at the navy-yard, Mare Island, California, November 16, 1883.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for oneday.
COMMANDANT'S OFFICE.				
John H. Tate.....	First clerk to commandant.....	\$1, 800	Pay miscellaneous.....	
William H. Skerrett.	Second clerk to commandant.....	1, 200	do.....	\$8 22
PROVISIONS AND CLOTHING.				
Theo. G. Hansche....	Pay clerk of yard.....	1, 800 00	Pay miscellaneous.....	
John A. Kelly.....	Pay clerk of Independence.....	1, 800 00	do.....	
Daniel Hubbard.....	Clerk, inspection P. and C.....	1, 300 00	do.....	
Walter Mallard.....	Writer, inspection P. and C.....	1, 017 25	Provisions.....	16 21
ORDNANCE.				
Paul B. Cooke.....	Writer.....	1, 017 25	Civil establishment.....	2 79
EQUIPMENT AND RECRUITING.				
S. B. Hammond.....	Foreman sail-maker.....	5 40	Equipment of vessels.....	
Thomas H. Sellers...	Quartermen rigger.....	4 50	do.....	
A. E. Barbour.....	Storeman.....	3 50	do.....	
F. M. Burmeister....	do.....	3 50	do.....	16 90
NAVIGATION.				
H. D. Richardson....	Clerk of department.....	1, 000 00	Civil establishment.....	2 74
YARDS AND DOCKS.				
Ed. A. Millats.....	Clerk of department.....	1, 400 00	Civil establishment.....	
Thomas O'Connor...	Writer.....	1, 017 25	do.....	
C. L. Macrae.....	do.....	3 50	Navy-yard, Mare Island.	
Frank R. Simonton..	Draughtsman.....	5 50	do.....	
J. P. Molitor.....	do.....	5 50	do.....	
W. L. Brown.....	Leveler.....	4 00	do.....	
W. K. Conger.....	Receiver and weigher.....	3 50	do.....	
Stephen Finnell.....	Captain of the watch.....	4 00	General maintenance.....	
J. Cass.....	Chief gardener.....	4 00	do.....	
William D. Shaw.....	Pilot of tug.....	4 80	do.....	
A. McDonald.....	Pilot of other boats.....	3 00	do.....	
Thomas Brennan.....	Mail messenger.....	2 74	do.....	
N. P. Hoffman.....	Reundsman.....	3 00	do.....	
P. St. John.....	Stable-keeper.....	3 32	do.....	
William I. Sargent...	Foreman laborer.....	5 00	Navy-yard, Mare Island.	

List of all civil employes, including formen, &c.—Continued.

Name.	Occupation.	Compensation.	Appropriation from which paid.	Pay for one day.
YARDS AND DOCKS—continued.				
J. P. M. Phillips	Quarterman brick-mason	\$6 00	Navy-yard, Mare Island.	.....
Robert Morris	Quarterman stone-mason	5 50	do .....	.....
Justin Wood	Leading stone-cutter	4 24	do .....	.....
D. C. Snyder	Leading stone-mason's helper	2 74	do .....	.....
J. Cilly	do	2 74	do .....	.....
J. J. Hurbert	Leading brick-mason's helper	3 24	do .....	.....
George Quinn	Watchman	2 50	do .....	.....
James Lane	do	2 50	do	\$87 95
MEDICINE AND SURGERY.				
William Worth	Apothecary at hospital	750 00	Pay of the Navy .....	.....
Samuel Englander	Apothecary at dispensary	1,000 00	do	4 79
STEAM ENGINEERING.				
A. L. Hatheway	Clerk of department	1,400 00	Civil establishment .....	.....
St. Clair Fletcher	Store clerk	3 90	Steam machinery .....	.....
August Klotz	Draughtsman	4 65	do .....	.....
L. Stewart	Foreman machinist	5 75	do .....	.....
A. M. Street	Foreman pattern-maker	5 75	do .....	.....
George J. Campbell	Foreman boiler-maker	5 75	do .....	.....
Marshall Jones	Foreman molder	5 75	do .....	.....
J. W. Housley	Foreman coppersmith	5 75	do .....	.....
James Blessington	Receiver and weigher	2 50	do .....	.....
J. Holzhaur	Quarterman machinist	4 76	do	48 40
CONSTRUCTION AND REPAIR.				
George W. Simonton	Clerk of department	1,400 00	Civil establishment .....	.....
W. A. Brace	Store clerk	1,300 00	do .....	.....
H. F. Mallett	Writer	3 31	Construction and repair.	.....
L. W. Powers	do	3 31	do .....	.....
George T. Schild	Draughtsman	6 00	do .....	.....
P. D. Grimes	Master shipsmith	6 00	do .....	.....
Charles Daly	Master joiner	6 00	do .....	.....
A. D. Stockford	Master painter	6 00	do .....	.....
John Mugridge	Master calker	6 00	do .....	.....
N. W. Collins	Master mast-maker	6 00	do .....	.....
C. J. Mosley	Master boatbuilder	6 00	do .....	.....
D. Harrington	Master iron-plater	6 00	do .....	.....
J. R. Mason	Master plumber	6 00	do .....	.....
M. H. Long	Quarterman shipwright	5 76	do .....	.....
N. G. Hilton	do	5 76	do .....	.....
Charles Bell	do	5 76	do .....	.....
Isaac M. Rutan	do	5 76	do .....	.....
John Bell	Quarterman joiner	5 26	do .....	.....
N. H. Hilton	Timber inspector	5 50	do .....	.....
Oliver Hyde	Superintendent sectional dock	5 00	do .....	.....
John L. Titcomb	Sawyer in charge of mill	5 50	do .....	.....
J. H. Much	Storehouse laborer in charge of floor	3 50	do .....	.....
J. W. Breed	do	3 50	do	119 32
NAVY PAY OFFICE, SAN FRANCISCO.				
E. J. Spaulding	First clerk	1,800 00	Contingent, Navy .....	.....
C. A. Fulton	Second clerk	1,600 00	do .....	.....
A. F. Gomez	Messenger	1,000 00	do	14 79

IV.

Statement of the number of mechanics, laborers, &c., employed at the United States navy-yard, Mare Island, California, on the 16th day of November, 1883.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF ORDNANCE.		
Riggers.....	2	\$6 80
Carpenter.....	1	4 00
Cooper.....	1	3 50
Watchman.....	3	7 50
Laborers.....	3	6 60
Boy.....	1	1 00
	11	29 40
BUREAU OF EQUIPMENT AND RECRUITING.		
Joiner.....	1	4 50
Sail-makers (2 apprentices).....	10	35 20
Riggers.....	11	44 00
Laborers.....	14	31 30
Minors.....	2	4 40
	38	119 40
BUREAU OF NAVIGATION.		
Laborer.....	1	2 00
BUREAU OF YARDS AND DOCKS.		
Engineers.....	9	35 88
Firemen.....	4	10 00
Joiners' apprentice.....	1	2 24
Wharf-builders.....	8	28 00
Brick-masons.....	5	27 50
Stone-masons.....	5	19 40
Riggers.....	2	7 60
Paver.....	1	4 00
Brick-masons' helpers.....	5	15 00
Stone-masons' helpers.....	38	90 15
Stone-cutters.....	21	78 40
Driver of fire engine.....	1	3 00
Hostlers.....	3	6 72
Teamsters.....	6	13 44
Messengers.....	2	4 48
Laborers.....	103	234 98
Boys.....	4	5 04
	218	585 83
BUREAU OF MEDICINE AND SURGERY.		
Engineer.....	1	1 67
Messman.....	1	1 00
Nurse.....	1	67
Stableman.....	1	83
Laborer.....	1	67
Cooks.....	2	1 50
Launderer.....	1	67
Scrubber.....	1	33
	9	7 34
BUREAU OF PROVISIONS AND CLOTHING.		
Cooper.....	1	3 50
Laborers.....	5	11 80
	6	15 30
BUREAU OF STEAM ENGINEERING.		
Machinists (4 apprentices).....	30	64 64
Pattern-makers (1 apprentice).....	3	9 60
Molders (1 apprentice).....	7	24 40
Coppersmiths (1 apprentice).....	4	11 20
Carpenters.....	2	8 00
Boiler-makers.....	17	62 40

Statement of the number of mechanics, laborers, &c.—Continued.

Rate.	Number.	Total of the pay-roll for the day in each class.
BUREAU OF STEAM ENGINEERING—Continued.		
Flange turner	1	\$4 04
Blacksmiths	2	9 00
Core-maker	1	3 24
Furnaceman	1	3 24
Plumbers	2	8 00
Laborers	8	18 40
Engine-tender	1	4 00
Fireman	1	2 50
Painter	1	2 80
Rivet-heaters	5	7 00
Machinists' helpers	3	7 50
Pattern-makers' helper	1	2 50
Boiler-makers' helpers	6	15 00
Smiths' helpers	2	5 00
Molders' helper	1	2 50
Coppersmith's helper	1	2 50
Plumber's helper	1	2 50
	101	279 96
BUREAU OF CONSTRUCTION AND REPAIR.		
Shipwrights (3 apprentices)	88	427 00
Calkers (2 apprentices)	31	150 00
Spar-makers (1 apprentice)	5	27 00
Millmen	9	34 80
Joiners (2 apprentices)	23	97 18
Saw-filer	1	4 00
Pattern-maker	1	4 00
Boatbuilders (2 apprentices)	5	15 60
Block-makers (1 apprentice)	4	15 75
Brass-molders	2	8 00
Coopers	2	7 00
Painters (2 apprentices)	8	23 79
Plumbers (1 apprentice)	2	6 00
Shipsmiths (2 apprentices)	15	63 03
Iron-platers (1 apprentice)	18	67 20
Coppersmith	2	8 00
Smiths' helpers	16	40 00
Engineers	6	24 00
Firemen	4	10 00
Tinner	1	3 00
Shipkeepers	9	22 50
Messenger	1	2 24
Laborers	38	94 10
Boys	2	2 52
Reamers	4	12 00
Oakum-spinners	6	15 00
Joiners for department yards and docks	10	37 80
Painters for department yards and docks	3	10 50
Blacksmiths for department yards and docks	5	22 04
Horse and ox shoer for department yards and docks	1	4 50
Smiths' helpers for department yards and docks	5	12 50
	327	1,271 05

V.

Statement of all the work being performed at the navy-yard, Mare Island, California, on or for vessels of war on the 16th day of November, 1883.

Bureau of Equipment and Recruiting.—Preparing standing rigging of the U. S. S. Monongahela; repairing furniture for, and cleaning chains of that vessel.

Bureau of Steam Engineering.—Fitting stern bearings and sea valves, rudder-post, rudder and shoe; cleaning shield; casting and molding bottom blow valves; molding rudder plates and bitts; making boiler braces; fitting breeching for boilers; making and fitting copper sleeve

for stern bearing; and making patterns for deck plates and coal scuttles—all for the U. S. S. Mohican; removing machinery and boilers from the U. S. S. Monongahela.

Bureau of Construction and Repair.—Planking battery, building head, laying launching ways, putting on false keel, plank sheer of both poop and forecastle decks, finishing work in hold; putting up ward-room, planing batteries, building storerooms, &c.; strapping dead-eyes, making spare tiller, some bolts, stanchions; work on first whale boat and third cutter; flood cocks ventilating pipes, pipes for opening in deck; calking batteries and wales; making quarter bands for spars, drilling knees for poop and forecastle deck—all for the U. S. S. Mohican; cutting out plank and clearing away deck over boilers; on straps, bands, &c., for spars; repairing mizzen-mast and building new yards; reefing out oakum; drilling on work for spars; taking out masts and clearing away *débris* from ship—all for the U. S. S. Monongahela.

8220 N—11

No. 7.—SALE OF OLD VESSELS.

MEMORANDUM CONCERNING THE SALE, UNDER THE FIFTH SECTION OF THE DEFICIENCY ACT, APPROVED MARCH 3, 1883, OF VESSELS STRICKEN FROM THE NAVY REGISTER.

In accordance with the provisions of an act of Congress, approved August 5, 1882, making appropriations for the naval service, Boards were appointed to examine all the vessels of the Navy and to report which of them were unfit for further service, or if the same were unfinished in any navy-yard, to report which could not be finished without great and disproportionate expense; and if the Secretary of the Navy concurred in opinion with the Boards, he was directed to strike the names of such condemned vessels from the Navy Register and report the fact to Congress. These Boards made their examinations, and upon their reports, concurred in by the Secretary, the following-named vessels have been stricken from the Navy Register: Congress, Guard, Kansas, Plymouth, Emerald, Massachusetts, Sabine, Connecticut, Iowa, Niagara, Oregon, Ohio, Pennsylvania, Virginia, Florida, Blue Light, New Orleans, Colossus, Java, Susquehanna, Glance, Burlington, Supply, Sorrel, Antietam, Dictator, Frolic, Relief, Pawnee, Rose, Benicia, old Monadnock, Narragansett, Nyack, Saco, Tuscarora, Alaska, Worcester, Canandaigua, Jean Sands, Shawmut, Savannah, Santee, Phlox, Wyoming, Roanoke, Cyane.

The fifth section of the act making appropriations to supply deficiencies, approved March 3, 1883, authorized the Secretary of the Navy to invite proposals for the purchase of such of these vessels as it was deemed to the interest of the United States to sell. Under this authority proposals were invited by advertisement June 21, 1883, for purchase of the following-named condemned vessels and the bids were publicly opened at the Navy Department September 20:

Congress, Guard, Kansas, and Sabine, at Portsmouth, N. H.

Iowa, Niagara, and Ohio, at Boston, Mass.

Blue Light and Florida, at New London, Conn.

New Orleans, at Sackett's Harbor, New York.

Susquehanna, at New York, N. Y.

Burlington, Glance, Sorrel, and Dictator, at League Island, Pa.

Frolic and Relief, at Washington, D. C.

Worcester, Shawmut, and Savannah, at Norfolk, Va.

Roanoke, at Chester, Pa.

Pawnee and Seaweed, at Port Royal, S. C.

All of these were sold to the highest bidders, with the exception of the Florida and Pawnee, for which there were no bids.

The highest bid for the Niagara, \$29,000, was accepted, but as there was an apparent misunderstanding as to her condition at the time of sale, the matter is still open.

The total appraisement of these vessels was \$271,300. The amount for which they sold was \$308,273, an advance of \$36,973.

As the condemned vessels at the Mare Island navy-yard had not

been appraised, and proposals could not be invited for their purchase in June, 1883, when the others were offered, they were advertised August 13, the bids to be opened November 20. They were the Alaska, Benicia, Narragansett, Nyack, Saco, Tuscarora, and old Monadnock.

All of these were sold, with the exception of the Benicia, for which no proposals were received. They were appraised at \$58,800 and were sold for \$76,480, an advance of \$17,680 over the appraisement.

The total appraisement of all the vessels sold under the statute was \$330,100, and the amount for which sold, \$384,753, an advance of \$54,653 over the appraisement.

No vessel was sold at less than the appraised value. The money received has been placed on deposit with the Treasurer of the United States, subject to check by the Secretary of the Navy, as the expenses connected with the sale and the cost of removing the unsalable are to be paid from the proceeds of the sale.

The cost of advertising, from bills paid thus far, amounts to \$4,363.98. There are still some outstanding bills on that account.

The act of March 3, 1883, above mentioned, further provided for re-advertising vessels in case they were not sold when first offered, and that the cost of advertising such should be paid from any forfeiture under the terms of the original sale. It still further provided that in the event of any condemned vessel under construction in the yards, unworthy of being completed, that could not be properly sold, and it became necessary to remove the same, the cost of such removal should be paid out of the net proceeds derived from the sale of other vessels. It was thought to the interests of the service to remove the following of that class: Massachusetts, Connecticut, Oregon, Pennsylvania, Virginia, Colossus, Java, and Canandaigua. Some of these vessels are now being broken up, and a similar disposition will be made of the others.

The Wyoming, Antietam, Supply, Emerald, Santee, Phlox, and Jean Sands, although stricken from the Navy Register, have been retained for purposes at the yards and stations for which they can be made useful. No disposition has been made of the Plymouth and Rose.

There has been no readvertisement of the vessels offered but not sold.

Copies of the advertisements and a list of the proposals received are herewith transmitted.

JNO. W. HOGG,
Chief Clerk.

NAVY DEPARTMENT,
November 30, 1883.

Proposals for purchase of vessels.

NAVY DEPARTMENT,
Washington, June 21, 1883.

In accordance with the provisions of fifth section of the act of Congress making appropriations to supply deficiencies, approved March 3, 1883, sealed proposals will be received at the Navy Department until noon on Monday, September 24, 1883, at which time and place they will be opened, for the purchase of certain vessels which have been stricken from the Navy Register, under authority of an act of Congress approved August 5, 1882, and which it is deemed for the best interests of the United States to sell.

The vessels offered, their appraised value, and their locality are, the Congress, \$25,400; Guard, \$2,800; Kansas, \$6,100; and Sabine, \$10,400, at Portsmouth, N. H. Iowa, \$44,600; Niagara, \$29,000; and Ohio, \$15,700, at Boston. Blue Light, \$500, and Florida, \$64,400, at New London, Conn. New Orleans, \$200 (on the stocks), at Sackett's Harbor, N. Y. Susquehanna, \$9,000, at New York. Burlington, \$3,000; Glance, \$400; Sorrel, \$200; and Dictator, \$33,800, at League Island, Pennsylvania.

Frolic, \$8,600, and Relief, \$2,600, at Washington, D. C. Worcester, \$25,400; Shawmut, \$5,300; and Savannah, \$10,600, at Norfolk, Va. Roanoke, \$37,200, at Chester, Pa. Pawnee, \$5,600, and Seaweed, \$500, at Port Royal, S. C.

Proposals must be submitted in a sealed envelope, addressed to the Secretary of the Navy, Washington, D. C., and indorsed "Proposals for the purchase of vessels," so as to distinguish them from other communications. No offer for more than one vessel should be included within one proposal.

The vessels will be sold, for cash, to the person or persons, or corporation or corporations, offering the highest prices therefor above the appraised value thereof. Each bid or proposal must be accompanied by a deposit in cash (or satisfactory certified check) of not less than 10 per cent. of the amount of the offer or proposal, and also a bond, with a penal sum equal to the whole amount of the offer, with two or more sureties, to be approved by the Secretary of the Navy, conditioned for the payment of the remaining 90 per cent. of the amount of such offer or proposal within thirty days from the date of its acceptance. In case default is made in the payment of the remaining 90 per cent., or any part thereof, within that time, said cash deposit of 10 per cent. shall be considered as forfeited to the Government, and shall be applied as directed in the act of March 3, 1883. All deposits and bonds of bidders whose proposals shall not be accepted will be returned to them within seven days after the opening of the proposals.

On application to the Department, a printed list will be furnished, giving general information concerning the vessels; also forms of bids and bonds which must be used by bidders. The vessels can be examined at any time by applying to the commandants of the yards.

The purchasers must remove the vessels purchased from the limits of the yards or stations within such reasonable time as may be fixed by the Department.

WILLIAM E. CHANDLER,
Secretary of the Navy.

Proposals for purchase of vessels.

NAVY DEPARTMENT,
Washington, August 13, 1883.

In accordance with the provisions of the fifth section of the act of Congress making appropriations to supply deficiencies, approved March 3, 1883, sealed proposals will be received at the Navy Department until noon on Tuesday, November 20, 1883, at which time and place they will be opened, for the purchase of certain vessels at the navy-yard, Mare Island, California, which have been stricken from the Navy Register, under authority of an act of Congress approved March 5, 1882, and which it is deemed for the best interests of the United States to sell.

The vessels offered and their appraised value are: The Monadnock (old), \$11,200; Alaska, \$18,300; Benicia, \$17,600; Tuscarora, \$9,900; Narragansett, \$8,900; Nyack, \$4,900; and Saco, \$5,600.

Proposals must be submitted in a sealed envelope, addressed to the Secretary of the Navy, Washington, D. C., and indorsed "Proposals for the purchase of vessels," so as to distinguish them from other communications. No offer for more than one vessel should be included within one proposal.

The vessels will be sold, for cash, to the person or persons, or corporation or corporations, offering the highest prices therefor above the appraised value thereof. Each bid or proposal must be accompanied by a deposit in cash (or satisfactory certified check) of not less than 10 per cent. of the amount of the offer or proposal, and also a bond, with a penal sum equal to the whole amount of the offer or proposal, with two or more sureties, to be approved by the Secretary of the Navy, conditioned for the payment of the remaining 90 per cent. of the amount of such offer or proposal within thirty days from the date of its acceptance. In case default is made of the remaining 90 per cent., or any part thereof, within that time, said cash deposit of 10 per cent. shall be considered as forfeited to the Government, and shall be applied as directed in the act of March 3, 1883. All deposits and bonds of bidders whose proposals shall not be accepted will be returned to them within seven days after the opening of the proposals.

On application to the Department, a printed list will be furnished, giving general information concerning the vessels; also forms of bids and bonds which must be used by bidders. The vessels can be examined at any time by applying to the Commandant of the Mare Island yard.

The purchasers must remove the vessels purchased from the limits of the yard within such reasonable time as may be fixed by the Department.

ED. T. NICHOLS,
Acting Secretary of the Navy.

Proposals received under the advertisements of the Secretary of the Navy of June 21, 1883, for the purchase of vessels stricken from the Navy Register and recommended to be sold.

[Those marked with an asterisk (*) were accepted.]

Name.	Address.	Amount.
BLUE LIGHT.		
(Appraised value, \$500.)		
M. M. Comstock	New London, Conn	\$780 00
George M. Williams	do	600 00
Matthew H. Gregory	Great Neck, Long Island	*1,011 00
D. M. Anthony	Fall River, Mass	810 00
J. C. Gwinn	Boston, Mass	785 00
D. W. Richards & Co.	New York	705 00
A. Purvis & Son	Philadelphia, Pa	800 00
BURLINGTON.		
(Appraised value, \$3,000.)		
C. H. Delamater & Co.	New York	*3,135 00
CONGRESS.		
(Appraised value, \$25,400.)		
Henry E. Lynch	New York	*26,006 00
DICTATOR.		
(Appraised value, \$33,800.)		
Edwin La Bars	New York, N. Y	39,075 00
A. Purvis & Son	Philadelphia, Pa	*40,250 00
FROLIC.		
(Appraised value, \$8,600.)		
J. P. Agnew	Alexandria, Va	*11,250 00
A. Purvis & Son	Philadelphia, Pa	9,100 00
GLANCE.		
(Appraised value, \$400.)		
Oliver H. Booth	Poughkeepsie, N. Y	500 00
Matthew H. Gregory	Great Neck, Long Island	651 00
William H. Swift	Boston, Mass	*1,505 00
Robert B. Tenney	Georgetown, D. C	510 00
C. H. Delamater & Co	New York, N. Y	495 00
Thomas P. Morgan	Washington, D. C	601 00
D. W. Richards & Co	New York, N. Y	491 00
A. Purvis & Son	Philadelphia, Pa	600 00
GUARD.		
(Appraised value, \$2,800.)		
Israel L. Snow	Rockland, Me	3,100 00
Hubbell & Porter	Syracuse, N. Y	2,905 00
C. A. Williams & Co	New London, Conn	*5,050 00
IOWA.		
(Appraised value, \$44,600.)		
Harvey S. Cook	Provincetown, Mass	9,000 00
Hubbell & Porter	Syracuse, N. Y	*44,605 00
KANSAS.		
(Appraised value, \$6,100.)		
Israel L. Snow	Rockland, Me	*7,100 00
Hubbell & Porter	Syracuse, N. Y	7,006 00
NEW ORLEANS.		
(Appraised value, \$200.)		
Alfred Wilkinson, jr.	Syracuse, N. Y	*427 50

Proposals received for the purchase of vessels, &c.—Continued.

Name.	Address.	Amount.
NIAGARA.		
(Appraised value, \$29,000.)		
Henry E. Lynch.....	New York.....	*\$29,000 00
OHIO.		
(Appraised value, \$15,700.)		
Israel L. Snow.....	Rockland, Me.....	*17,100 00
John G. Thompson.....	North Truro, Mass.....	1,500 00
Samuel P. Hedges.....	Greenport, N. Y.....	17,000 00
Edwin La Bars.....	New York, N. Y.....	16,106 00
RELIEF.		
(Appraised value, \$2,600.)		
Frank P. Davis.....	New York.....	3,155 00
J. P. Agnew.....	Alexandria, Va.....	*3,350 00
A. Purvis & Son.....	Philadelphia, Pa.....	3,050 00
ROANOKE.		
(Appraised value, \$37,200.)		
E. Stannard.....	Westbrook, Conn.....	*45,070 50
A. Purvis & Son.....	Philadelphia, Pa.....	40,700 00
SABINE.		
(Appraised value, \$10,400.)		
Israel L. Snow.....	Rockland, Me.....	*11,100 00
E. Stannard.....	Westbrook, Conn.....	11,009 00
SAVANNAH.		
(Appraised value, \$10,600.)		
E. Stannard.....	Westbrook, Conn.....	*12,403 00
SEAWEED.		
(Appraised value, \$500.)		
William Cutler.....	Jacksonville, Fla.....	600 00
James D. Kenney.....	Brunswick, Ga.....	512 50
P. Sanford Ross.....	Jersey City, N. J.....	600 00
M. J. Dady.....	Brooklyn, N. Y.....	*650 00
J. H. Walker.....	Westbrook, Conn.....	605 00
Rocky Point Oyster Company.....	Maryland.....	600 00
SHAWMUT.		
(Appraised value, \$5,300.)		
E. Stannard.....	Westbrook, Conn.....	*8,106 00
SUSQUEHANNA.		
(Appraised value, \$9,000.)		
Joseph L. Piper.....	East Boston, Mass.....	12,555 00
E. Stannard.....	Westbrook, Conn.....	*13,143 00
SORREL.		
(Appraised value, \$200.)		
Matthew H. Gregory.....	Great Neck, L. I.....	211 00
John E. Wayson.....	Annapolis, Md.....	305 00
Edward Hobbs.....	Philadelphia, Pa.....	226 50
A. Purvis & Son.....	Philadelphia, Pa.....	*400 00
WORCESTER.		
(Appraised value, \$25,400.)		
E. Stannard.....	Westbrook, Conn.....	*27,611 00

Proposals received under the advertisement of the Secretary of the Navy, of August 13, 1883, for the purchase of vessels stricken from the Navy Register, and recommended to be sold.

[Those marked with an asterisk (*) were accepted.]

Name.	Address.	Amount.
ALASKA.		
(Appraised value, \$18,300.)		
William Buhler, jr	New York	\$18,900 00
William E. Mighell	San Francisco, Cal	*25,050 00
MONADNOCK.		
(Appraised value, \$11,200.)		
William Buhler, jr	New York	14,100 00
Farnham & Robinson	Vallejo, Cal	12,300 00
William E. Mighell	San Francisco, Cal	*15,150 00
P. Clancy	Boston, Mass	15,100 00
NARRAGANSETT.		
(Appraised value, \$8,900.)		
William Buhler, jr	New York	9,450 00
William E. Mighell	San Francisco, Cal	*11,050 00
P. Clancy	Boston, Mass	10,400 00
NYACK.		
(Appraised value, \$4,900.)		
William Buhler, jr	New York	5,700 00
William E. Mighell	San Francisco, Cal	*6,050 00
A. Powell	Vallejo, Cal	5,500 00
P. Clancy	Boston, Mass	5,800 00
SACO.		
(Appraised value, \$5,600.)		
William Buhler, jr	New York	6,125 00
William E. Mighell	San Francisco, Cal	*6,850 00
A. Powell	Vallejo, Cal	6,100 00
P. Clancy	Boston, Mass	6,700 00
TUSCARORA.		
(Appraised value, \$9,900.)		
William Buhler, jr	New York	10,600 00
William E. Mighell	San Francisco, Cal	*12,330 00
P. Clancy	Boston, Mass	10,900 00

No. 8.—MOVEMENTS OF VESSELS.

NORTH ATLANTIC STATION.

Rear-Admiral George H. Cooper, United States Navy, commanding. Vessels: (flagship) Tennessee, 1st rate; Vandalia, 2d rate; Alliance, 3d rate; Swatara, 3d rate; Yantic, 3d rate. The U. S. S. Kearsarge was detached from the North Atlantic and transferred to the European squadron May 31.

TENNESSEE.

The Tennessee cruised among the West India Islands during the months of January and February, and sailed from Aspinwall March 2 for New Orleans; arrived at that port March 14. Sailed from New Orleans March 30 for Key West via Pensacola. Sailed from Key West for Port Royal April 7; arrived at Port Royal April 10. Sailed for Hampton Roads April 18; arrived at Fortress Monroe April 21; arrived at New York May 22; took part in the celebration on the occasion of the Brooklyn bridge opening, in company with Vandalia and Yantic. July 10, sailed from New York for La Guayra, Venezuela, to participate in the celebration of the unveiling of the statue of George Washington at Caracas upon the occasion of the Bolivar centennial celebration, when Rear-Admiral Cooper and personal staff were decorated with the order of "El Busto del Libertador" by the President of Venezuela, acting with the advice and consent of the Federal Council. Sailed from La Guayra for Portland, Me., August 1; remained at Portland until September 4; made a short cruise along the New England coast and arrived at New York September 27, preparatory to taking part in the centennial celebration at Newburg, in company with other vessels of the North Atlantic and training squadrons. October 16, left New York for Newburg and assisted in the above celebration, upon the completion of which returned to New York. Took part in the celebration in New York Harbor, on the centennial anniversary of the evacuation of New York, November 26, 1883.

VANDALIA.

Cruised in West Indies during January and February, 1883; arrived at New Orleans from Havana, March 16; arrived at Key West April 7 and sailed same day for Port Royal, arriving there April 10. Sailed for Hampton Roads April 18; arrived at Hampton Roads June 30. July 19, sailed for New York; July 27 left New York for a cruise along Fishing Banks and through British Provinces which extended until September 20; arrived at Boston September 27. October 6, sailed for New York *en route* to Newburg, where she took part in the centennial celebration October 18, after which returned to New York, and assisted in the celebration on the centennial anniversary of the evacuation of New York, November 26, 1883.

ALLIANCE.

Cruised in the West Indies during January and February; arrived at New Orleans March 16. March 31 arrived at Pensacola navy-yard; coaled, and proceeded to Tampico, Mexico, on surveying duty, upon the completion of which proceeded to Hampton Roads, touching at Key West for coal; arrived in Hampton Roads in May and remained at Norfolk until July 2; then sailed for New York, arriving July 5. July 6 sailed for a cruise on the Fishing Banks; returned to New York from this cruise on October 14. Sailed for Newburg October 16, and took part in the centennial celebration October 18. After which returned to New York. Ordered to destroy wreck off Shinnecock Light, and to proceed to Port au Prince, Hayti, to look after American interests.

SWATARA.

Cruised in West Indies and along the Spanish Main during January, February, March, and April. May 1 arrived at Aspinwall. May 24 arrived at Key West (machinery disabled). Ordered to New York yard for repairs; arrived at New York June 7. Remained at New York until August 23, when sailed for a cruise on the Fishing Banks; arrived at Boston on return from this cruise October 4. Ordered to Port au Prince, Hayti, and sailed from Boston October 10 for that port.

YANTIC.

February 25, 1883, arrived at navy-yard, Pensacola. March 5, sailed for Mobile. March 6, arrived at Mobile. March 12, sailed from Mobile for New Orleans. March 14, arrived at New Orleans. April 2, sailed from New Orleans for Key West. April 6, arrived at Key West, Fla. April 9, sailed from Key West for Savannah via Elbow Key. April 14, arrived at Savannah. April 21, sailed for Charleston, S. C. (via Tybee Roads). April 21-24, anchored in Tybee Roads. April 25, arrived at Charleston, S. C. May 3, sailed for Hampton Roads. May 6, arrived at Hampton Roads. May 20, sailed from Hampton Roads for New York. May 22, arrived at New York and anchored off Battery. May 31, ordered to navy-yard, New York, to prepare for Arctic cruise. June 9, ordered to proceed to Arctic regions with steamer Proteus, not to go farther north than Littleton Island, nor to enter the ice pack. June 13, sailed from New York for Saint John's. June 21, arrived at Saint John's. June 29, sailed from Saint John's for Disco, in company with Proteus. July 12, arrived at Godhaven, Disco Island. July 22, sailed for Rittenbeck. July 23, arrived at Rittenbeck. July 24, sailed from Rittenbeck for Kudtlissat. July 26, sailed from Kudtlissat for Upernavik. July 27, arrived at Upernavik. July 31, sailed from Upernavik for Littleton Island. August 3, arrived off Littleton Island. September 12, arrived at Saint John's with wrecked Proteus party. September 29, arrived at New York with Lieutenant Garlington's party on board.

PACIFIC STATION.

Under command of Rear-Admiral A. K. Hughes. Vessels: Hartford (flagship), 2d rate; Lackawanna, 2d rate; Iroquois, 3d rate; Wachusett, 3d rate; Adams, 3d rate; Onward (store-ship), 4th rate. The Pensa-

cola (2d rate) was detached from the Pacific station in June last, and ordered to return to the United States via Honolulu, Japan, China, and Cape Town. Arrived at Honolulu August 19. September 1, left for Yokohama, arriving October 10.

HARTFORD.

Arrived at Callao from the United States January 11, 1883. Proceeded to Caroline Island with party of observers of solar eclipse in May last. Returned to Callao via Honolulu; arrived at Callao August 18. August 21, became flagship of Pacific squadron bearing flag of Rear-Admiral A. K. Hughes, United States Navy. Arrived at Panama September 21. Sailed from Panama for cruise along Central American coast; returned to Panama October 26. Sailed November 14 for Callao.

LACKAWANNA.

Was present at Honolulu during coronation ceremonies of King Kalakaua on February 12. April 21, sailed for Callao; arrived at Callao June 19. Sailed for coast of Chili September 13. Upon the departure of the Pensacola for the United States, the Lackawanna carried the flag of Rear-Admiral Hughes temporarily until the arrival of the Hartford from Honolulu.

IROQUOIS.

January 27, while lying at Callao, Peru, was cabled by Department to proceed south owing to yellow fever having appeared on board. Remained in Chilean waters during summer months; returned to Callao with orders to remain there until further orders (September 10).

WACHUSETT.

Was present at Honolulu during coronation of King Kalakaua, February 12, after which visited Samoan and Society Islands. Arrived at Callao August 18. Ordered to take United States minister to Bolivia to Mollendo, and then proceed to Chilean coast, returning to Callao by December 1.

ADAMS.

Employed in Alaskan waters with headquarters at Sitka.

ONWARD.

Store-ship at Callao, Peru.

ASIATIC STATION.

Vessels: Richmond (2d rate), flagship; Monocacy (3d rate); Ashuelot (3d rate), lost February 18, near Lamock Island; Palos (4th rate); Enterprise (3d rate); Essex (3d rate); Juniata (3d rate). The last three vessels have joined the Asiatic squadron during the present year.

April 21, Rear-Admiral Pierce Crosby, United States Navy, relieved Rear-Admiral J. M. B. Clitz in command of this station, at Hong-Kong.

RICHMOND.

The Richmond remained at Hong-Kong and vicinity from January 3 until the arrival of Rear-Admiral Pierce Crosby on board, after which visited Yokohama and other Japanese ports, and arrived at Shanghai June 23. Returned to Yokohama, Japan, latter part of July; has remained in Japan since then.

MONOCACY.

January 31, sailed from Nagasaki, Japan, for Amoy. Ordered to return to Nagasaki, Japan, and take United States minister to Corea, April 20. Performed this service, and has been employed in Corean waters since. Brought Corean embassy from Corea to Nagasaki and returned.

ASHUELOT.

Was wrecked off Lamock Islands, February 18, 1883.

PALOS.

After wintering at Tientsin proceeded to Nagasaki, Japan; thence to Hong-Kong, from which port proceeded to Canton on the occasion of the uprising of the Chinese mob, and at last accounts was still anchored in the Canton River off the city.

ENTERPRISE.

On December 13 last, ordered to proceed by way of the Cape of Good Hope to Asiatic Station, touching at Porto Grande, Cape de Verdes, Cape Town, South Africa, calling at Port Elizabeth and Natal, St. Augustine and Tullear Bays, southwest coast of Madagascar; then to Nos Beh, Comorro Islands, Zanzibar, Tamatave, east coast of Madagascar, west coast of Borneo, Labuan and Sandaken Bays, Sooloo and Philippine groups, and thence to Hong-Kong. Sailed on above cruise from Lynn Haven Bay, January 2. Upon the occasion of the earthquake at Batavia and vicinity was called to visit the neighboring waters and advise vessels of existing dangers. Performed this service and proceeded to Hong-Kong; arrived at that port October 8.

ESSEX.

March 30, orders sent to the commander-in-chief of Pacific Station to order Essex to Asiatic Station as early as practicable. May 10, Essex sailed from Callao for Honolulu and Yokohama; arrived at Honolulu June 18. July 8, sailed for Yokohama, Japan; arrived at Yokohama, August 10. Ordered to Corea by Rear-Admiral Crosby. Relieved Monocacy at Roze Island, Corea, while that vessel visited Chefoo. Upon return of Monocacy, Essex sailed for Nagasaki, where she arrived October 5.

JUNIATA.

Left New York on November 28 last with orders to report on the Asiatic Station, via Suez Canal; arrived at Hong-Kong October 1 and proceeded to Canton, having visited the following ports on the way out: Fayal, Gibraltar, Malta, Alexandria, Aden, Muscat, Basrah, River Euphrates; Bushire, Persia; Karachi, Bombay, Trincomalee, Pondicherry, Rangoon, Penang, Batavia, and Singapore.

SOUTH ATLANTIC STATION.

Vessels: Brooklyn (flagship); Galena (3d rate), relieved by Nipsic; Rear-Admiral Pierce Crosby, commander-in-chief until January 30, when transferred to the command of Asiatic Station. Relieved by Captain Weaver, commanding Brooklyn, who remained in command until June 5, when Commodore T. S. Phelps assumed command.

BROOKLYN.

Brooklyn visited Rio de Janeiro and Montevideo during the first part of the year. July 3, orders sent to Commodore Phelps to proceed with the Brooklyn to coast of Madagascar, visiting St. Augustine and Tullear Bays on the southwest coast; Monrondarah, Nos Beh, and Majunga, on the west coast, Tamatave, on the east coast, and such other places as he may consider necessary; also to visit the Comorro Islands, and such other islands within the limits of the South Atlantic Station as he may desire or find necessary; to visit ports on the east coast of Africa, extending cruise as far north as Zanzibar, under no circumstances omitting the latter place. Upon return to east coast of South America to visit island of St. Helena.

GALENA.

Visited Colonia and Montevideo, Uruguay, from February to July. Sailed from Montevideo July 5 for Hampton Roads; arrived August 29. Ordered to New York as soon as coaled; arrived at New York September 3 and put out of commission.

NIPSIC.

June 14, sailed from New York for duty on South Atlantic Station; arrived at Rio de Janeiro August 10. From Rio de Janeiro sailed for Montevideo; arrived at Montevideo August 30.

THE LIMITS OF THE SOUTH ATLANTIC STATION.

These have been extended to 70° east longitude, and as far north as the equator. (This includes the Island of Madagascar and adjacent islands.)

EUROPEAN SQUADRON.

Rear-Admiral C. H. Baldwin, United States Navy, commanding, March 10, 1883. Rear-Admiral Baldwin relieved Rear-Admiral J. W. A. Nicholson in command.

Vessels: Lancaster (flagship), 2d rate; Quinnebaug, 3d rate; Kearsarge, 3d rate.

LANCASTER.

During the month of January the Lancaster cruised in the Mediterranean. Proceeded to England in February, touching at Gibraltar February 4; Corunna, Spain, February 11; arrived at Plymouth, England, 48 hours from Corunna, February 17; arrived at Southampton, February 20. February 25, sailed for Havre, France. Left Havre April

17 for Antwerp, thence to Cronstadt, Russia, with instructions for Rear-Admiral Baldwin to be present with his staff at the coronation of the Emperor at Moscow. Left Cronstadt for Stockholm, June 21; arrived at Stockholm, June 23. Sailed for Copenhagen June 28; arrived June 30. Sailed July 5 for Christiania, Norway; arrived July 6. Sailed for Cuxhaven, July 14, thence to Ville Franche. Remained at Ville Franche until September 5, when sailed for Port Mahon; arrived at Port Mahon September 7. Sailed for Cadiz, Spain, September 21; arrived September 25; thence for a cruise in the Mediterranean, October 5.

QUINNEBAUG.

Employed on the African coast from January to August. Arrived at Southampton, England, August 17. Ordered to Leghorn, Italy, for repairs.

KEARSARGE.

Arrived at Lisbon, Portugal, September 20, and reported for duty on European Station. September 30, arrived at Cadiz, Spain. October 3, sailed for Casa Blanca and Mogador, coast of Morocco.

SPECIAL SERVICE.

POWHATAN. (2d rate.)

Powhatan (2d rate). Employed from January to latter part of May cruising in West Indies and along Spanish Main. May 26, arrived at Key West; ordered to Port Royal, South Carolina, to assist in survey of Beaufort Harbor. June 19, ordered to proceed to sea and destroy wreck off Cape Canaveral. Performed this duty and arrived in Hampton Roads, Virginia, June 29; ordered thence to New York navy-yard for slight repairs. From New York, ordered to prepare for cruise on Fishing Banks. Sailed for Fishing Banks September 8; returned from cruise, arriving at Boston October 18.

MICHIGAN. (4th rate.)

Has been undergoing extensive repairs at Erie, Pa., and is now about ready for service on the lakes.

RANGER. (3d rate.)

Employed on surveying duty on Mexican and Central American coasts. Has just been repaired at Mare Island navy-yard, and returned to her station.

TALLAPOOSA. (4th rate.)

Employed in carrying freight, &c., to different navy-yards on Atlantic coast.

DESPATCH. (4th rate.)

Washington navy-yard, waiting orders.

TRAINING SQUADRON.

Commodore S. B. Luce, U. S. N., commanding. Vessels: New Hampshire (flagship, 2d rate), at Newport, R. I.; Minnesota (1st rate), gunnery ship, New York; Saratoga (3d rate), sailing ship; Jamestown (3d rate), sailing ship; Portsmouth (3d rate), sailing ship.

SARATOGA.

February 19, left New York yard on a cruise to Lisbon and Santa Cruz, Island of Teneriffe; arrived at Lisbon, March 22; arrived at Santa Cruz, Teneriffe, April 14; arrived at New York May 21. Cruised along Atlantic coast of the United States during the summer, and participated in the centennial celebration at Newburg.

JAMESTOWN.

Sailed from Boston January 18 for a cruise in the West Indies. Employed on this duty until May; then returned to Newport. July 13, sailed for Lisbon, Portugal; returned to Newport October 30.

PORTSMOUTH.

Sailed from Boston January 22 for a cruise in the West Indies; returned from cruise and arrived at Newport, R. I., May 15. Ordered to cruise for the summer along Atlantic coast of United States. Took part in centennial celebration at Newburg. Has gone to Norfolk navy-yard for repairs.

No. 9.—FINDING OF THE COURT ON THE LOSS OF THE HURON.

DEFENSE OF THE LATE LIEUT. L. G. PALMER.

WASHINGTON, D. C., November 30, 1883.

DEAR SIR: I have been asked by the family of the late Lieut. Lambert G. Palmer to examine carefully the testimony and findings of the court of inquiry had on the loss of the United States steamer Huron in 1877, and to give my opinion as to whether that portion of the findings of the court which reflects upon the conduct of Lieutenant Palmer, as the navigating officer of the ship at the time of her loss, agrees with the testimony upon which it is claimed to be founded; and I am also requested, if I shall think that these reflections are not justified by the evidence, to bring the fact to the notice of the Department.

The court of inquiry was ordered on November 30, 1877, by Hon. R. W. Thompson, the then Secretary of the Navy, and the investigation was concluded and the findings made on the 17th of December of the same year.

A comparison of the testimony given in the case with the findings of the court, by any intelligent person, even though not an expert, will show them to be utterly inconsistent upon the very points most vital to the accuracy of their conclusions.

The record as furnished in Senate Ex. Doc. No. 26, Forty-fifth Congress, second session, shows that in the stating part of the findings of the court, summed up probably by the judge-advocate, as a foundation for their conclusions, there are at least two mistakes of statement utterly inconsistent with the testimony and directly changing its result, without which changes the conclusion of the court upon the points referred to could not have been arrived at.

The first of these mistakes makes the foundation of the only reflection made upon the conduct of Lieutenant Palmer. It is contained in the following statement, found on page 35 of the record:

1. The navigating officer is also responsible for not taking bearings to Currituck light, after passing it, and while it remained in sight, which, by showing the direction from a fixed point, would have established the Huron's proximity to land.
2. That no back bearings appear to have been taken.

These statements are deliberately made in the finding; while the fact is that no witness testifies that the bearings of Currituck light were not taken, but all the evidence going to that point, shows that they were taken.

Master Wm. P. Conway, in his testimony on page 3, states that the ship passed Currituck light at 6.30 p. m.; that "after that" the navigator, Lieutenant Palmer, compared the soundings made and *the bearings of the light*, though he does not fix the exact time; and he further says that he thinks that careful bearings of the light were taken and used to plot the place of the vessel. And the other witness on this point, Ensign Lucien Young, in his testimony on pages 15 and 16, states, in effect, that he was told by the navigator, Lieutenant Palmer, shortly

before he was drowned, that he had taken the bearings of Currituck light as he passed it, and that when he lost or "*left*" Currituck light, about 11 p. m., he compared the course steered up to that time with the soundings and *bearings* and found the ship where she should be at the time. And Master Conway's letter of April 7, 1878, to the father of Lieutenant Palmer, conclusively shows exactly what he meant by his testimony as given to the court. That letter contains the following statement:

You ask: Did the navigator take bearing of Currituck light as long as it was available in sight? And I reply that those bearings were commenced from an accurate departure from Cape Henry, taken upon first sighting Currituck on starboard bow, and continued till we lost sight of the light on starboard quarter, in $14\frac{1}{2}$ to 15 fathoms

This is the whole of the testimony given to the court upon this point, and thus it appears without question that the statement of the findings, on page 35 of the record, above quoted, to the effect that the navigating officer "*did not* take the bearings of Currituck light after passing it, and while it remained in sight," and "that no *back bearings* appear to have been taken," are not only wholly unsupported by, but are actually contrary to, the testimony, and therefore that the reflection of the court and its *quasi* censure on the conduct of Lieutenant Palmer, as the navigating officer of the ship, are not in any sense justified by the proof; and, being founded wholly upon these mistaken statements, should be without weight or effect upon any one.

This conclusion and its acceptance would seem to be all that is necessary to clear the memory of Lieutenant Palmer from every suggestion of responsibility for the loss of the Huron.

If the real cause of the loss of the Huron is to be sought for now, it would not be difficult to find it by a careful examination of the testimony, in the light of the larger knowledge of the magnetic incidents connected with the navigation of iron ships which the naval experiences of the last six years have developed and illustrated. It will be seen by the record in this case (page 34) that it is stated in effect "that the *heeling* variations of the compass" for the Huron were furnished to her commanding officer by the professor of mathematics who had the subject-matter in charge.

This statement is not only inconsistent with, but exactly contrary to, the testimony of the professor himself upon this very subject, to be found on page 27 of the record, where he says:

I made, but did not furnish to the commander of the Huron, observations of horizontal and vertical force to determine the effect of the ship's *heeling* and the other magnetic elements of the ship. The reason for *not furnishing* the result of these observations to the Huron was that the heeling coefficient was so small, and that her southern cruise would take her where the heeling deviation would become less and less.

Thus it is seen that the *heeling* variations of the compass of the Huron were in fact "*not furnished*" to her commander, and the effect of this omission was a material variation of the course of the ship on the night of her wreck; a variation of which her commanding officer and navigator were uninformed, and the effect of which could not be noticed by them without any land or light in sight from which to take their bearings.

If these variations had been known and allowed for, and the course of the ship changed by this allowance, it would have placed her, at the time when she struck, about three miles from shore, and in a situation where the soundings would have brought to the knowledge of her officers the fact that her course was being affected somewhat by the inset or current to the shore.

A *heeling* variation, which amounted at least to the difference of three miles in the position of the Huron, on the night and at the time of her wreck, could hardly be too small for notice to the commanding officer, and his want of knowledge of it was a grave misfortune.

These general observations, and this conclusion, are fully established by the careful review of the testimony upon these two points, and the marking out and fixing of the real course of the ship as actually shown by the testimony, which are contained in the pamphlet of Mrs. Palmer and the other paper and chart hereto annexed, marked respectively A and B.

To the friends of Lieutenant Palmer these conclusions seem to be sufficient to free his memory from any blame which may seem to rest upon it from the findings of the court; and they think that whatever consideration may now deter the Department from entering upon a review of the case of the Huron, some reference to these facts by the Department would be but small justice to the memory of the dead.

Very respectfully, your obedient servant,

GEO. M. ROBESON.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy.

EXHIBIT A.

THE LOSS OF THE HURON.

A VINDICATION OF LIEUT. LAMBERT G. PALMER.

Having tried in vain for more than five years to obtain from the Navy Department the exercise of the ordinary justice accorded by our civil courts to all—the right to be considered innocent in the absence of all evidence to the contrary—I am forced to have recourse to this means of making known to his fellow-countrymen my husband's innocence of the neglect of duty imputed to him after his death by the court of inquiry on the loss of the Huron.

I therefore publish here a complete copy of the record of that court (Senate Doc. No. 26), with interlineations as amended and finally adopted by the court December 17, 1877 (see page 36 of record), and call attention to the fact that the "finding" of the court with regard to the navigating officer of the Huron is *wholly unsupported* by the evidence taken before it.

On page 35 of the record we read in the finding of the court as follows:

"The court is therefore of opinion that Commander Ryan is primarily responsible for the grounding and loss of the Huron. The navigating officer is also responsible for not taking bearings of Currituck light after passing it and while it remained in sight."

Again, on page 35:

"The requirements of sounding and taking bearings seem to have been observed, except that no back-bearings appear to have been taken."

In the first paragraph here quoted the court asserts positively that the navigator "is responsible" for not taking these back-bearings; and in the second paragraph quoted these back-bearings only "appear" not to have been taken. That there is no evidence in support of either assertion I am prepared to show by the record of the court itself.

Of the sixteen officers of the Huron, but four survived the wreck. Both the captain and the navigator perished. One of the only two officers who had charge of the deck during the time when these back-bearings were (or were not) taken was also drowned. All four quartermasters, good witnesses on this point, were lost, as also were both log-book and chart. Two of the four surviving officers belonged to the Engineer Corps of the Navy, and were asked no questions by, and gave no evidence before, the court on this point.

The remaining two officers, Master William P. Conway (the only survivor who had charge of the deck during any part of the time in question) and Ensign Lucien Young, testified as follows:

Master William P. Conway (page 3 of record): "At 6 p. m. I went on watch and took charge of the deck, * * * (page 4) Currituck light was then from one-half to a whole point forward of the starboard beam. *It bore exactly on the beam at half-past six.*"

After this all bearings taken of this light must of necessity have been *back-bearings*. Mr. Conway continues: "At a quarter before seven o'clock the lead was cast, and found about 14 fathoms. The quartermaster gave the sounding as 15 fathoms. Mr. Palmer, the navigator, asked me if the line was up and down. I answered, 'A little off on the beam, and should allow about one fathom.' * * * *After that* Mr. Palmer told me that this sounding agreed with the course and the bearing of Currituck light." Was not this a *back-bearing*?

The court, in its finding (page 34), actually alludes to this very bearing as "the bearing taken at 6.45 p. m.," which it afterwards finds not taken.

Mr. Conway continues (page 4): "I went into the cabin at 8 o'clock; * * * after that I went below, and was on deck again about half-past 10 o'clock, and Currituck light was then about one or two points on the starboard quarter, just visible as the ship rose on the waves."

Sixteenth question by the court (page 8). "During the time in which Currituck light was in sight were careful bearings taken of it?"

Answer. "I am unable to say." Because he was below from 8 to 10.30. (See page 4.)

Twenty-second question by the court. "Do you know whether bearings to Currituck light and assumed distances from it were used to plot the place of the vessel?"

Answer. I do not positively know, but *I think they were.*" He had "looked at the charts" (see page 4), and this was his opinion, and it is all the evidence given on this point by Master Conway, the only surviving witness with regard to the bearings of Currituck light who testified to being on deck at all during the time when it would have been possible to take these *back-bearings*, and we see by his testimony that he was on deck during only a portion (less than half) of that time, the whole of which comprised little more than four hours. In the absence of positive knowledge on his part, should not the opinion of this intelligent witness, who had once been navigator of this same ship himself, have been accounted something in behalf of the dead?

The only remaining witness on this point, Ensign Lucien Young, testified (see pages 15 and 16) by repeating a frequently interrupted conversation he held with the navigator after the vessel struck, in which he said: "He [the navigator] told me he had taken the bearings of Currituck light as he ran by" (there would have been little reason for taking these bearings unless he intended to take subsequent ones), "and that he was on the quarter-deck, I think, when the Huron struck; that when he left Currituck light he had 14½ to 15 fathoms soundings, which, with the bearings" (bearings of what—no other light was visible, and what bearing could he have taken as he left Currituck light but a *back-bearing*?), "he said put him exactly where the course ought to put her * * * that he had had the course" (coasting?) "lead, 25 pounds lead, going every hour, and I think at one half-hour, 11½ or 12½, after we lost Currituck light, which we lost between 10.30 and 11 o'clock; that he got bottom from 14½ to 15, and at one o'clock in 13 fathoms, and that she struck ten to fifteen minutes afterwards. We both went and looked at the chart, and he pointed and said, 'We are about off there.'" So ends all evidence taken before the court with regard to the *back-bearings* of Currituck light.

Even if no opinion had been expressed by Master Conway, no testimony given by Ensign Young favorable to the presumption that the bearings of Currituck light were faithfully taken, and simply supposing the absence of all evidence one way or the other, should not a man who died at his post of duty have been given the benefit of a doubt; what, then, in the face of the actual testimony as recorded by the court itself?

In the finding of the court we read (page 36): "The court does not consider that a seaman-like attention and precision were given to either the soundings or the bearings taken." But, on page 35 (also in the finding), we have already read: "The requirements of sounding and taking bearings seem to have been observed, except that no *back-bearings* appear to have been taken."

Now, what bearings could they have been to which a seaman-like attention and precision were not given? They could not have been those taken before Currituck light bore abeam, for the court found that the "requirements" of sounding and taking bearings seemed to have been observed, *except* that no *back-bearings* appeared to have been taken; and bearings taken according to the requirements must have been taken with seaman-like attention and precision. Could they then have meant the *back-bearings*?

How can a man be "considered" to have performed a duty badly after he has been already censured for not doing it at all?

The finding with regard to the soundings to which "a seaman-like precision was not given" reflects upon so many—watch officers as well as crew of the Huron—that the

censure it involves is a very sweeping one, although the court "finds," on page 35, that the soundings off this portion of the coast are so irregular that depths less than 20 fathoms can give no reliable information in regard to position or distance from the shore."

Now, if this finding of the court is correct, and, as the record shows, that at no time after 6.45 p. m. were the soundings as deep as 20 fathoms, even the most accurately taken soundings would, according to the court, have given "no reliable information;" and consequently the bare fact of the loss of the ship can hardly suggest—still less prove—a want of seaman-like precision in taking them.

After the adjournment of the court, further testimony was received that the bearings of Currituck light were carefully taken from the first to the last glimpse of it; in evidence of which I submit the following letter, the original of which I have, from Ensign Young to Surgeon-General Palmer:

U. S. S. PORTSMOUTH, *Havre, France, April 7, 1878.*

MY DEAR DOCTOR: I regret very much my not being able to answer your letter in New York and that the marginal notes I wrote on your letter* to the Secretary explaining my evidence were written in lead pencil, which I hope you will excuse.

You ask: "Did the navigator take bearings of Currituck light as long as it was available in sight?" and I reply that those bearings were commenced from an accurate departure from Cape Henry, taken up on first sighting Currituck on starboard bow and continued till we lost sight of the light on starboard quarter in 14½ to 15 fathoms. * * * The conversation† was broken by people going in and out, Palmer helping me and at times going out on deck.

All of this is exactly what I meant, and I sincerely hope it will assist materially in causing people to do justice to the memory of one of the most careful officers I ever saw, and his heroic death is sufficient evidence of what he was. * * *

Sincerely your friend,

LUCIEN YOUNG,
Ensign United States Navy.

Thirteen survivors of the *Huron's* crew were examined by the president of the court, Admiral Rowan, but they were dismissed without being questioned as to what they might, or might not, have observed with regard to these back-bearings.

They were asked, however, the following question (see page 29): "Have you anything to lay to the charge of any officer or man with regard to the loss of the *Huron*?"

To this, each and all of the said thirteen survivors answered, "No."

Seven more survivors of the crew were afterwards asked the same question (page 31), with the same result. These men, who, counting Michael Trainor, numbered twenty-one, were the only survivors of the crew who were examined by the court. The remaining nine, whose names are among those in the list of the saved, on page 46 of record, were not examined at all.

Michael Trainor, captain of the afterguard, was asked (page 26): "How did the officers and men perform their duties during your last watch?" Answer. "First rate;" adding then, apparently of his own accord, "That was so all day and night, in every watch." This man was on deck (see page 25) more than half of the time, during which Currituck light was available for taking back-bearings and while the navigator was (or was not) faithfully attending to his regular duties; but Michael Trainor, as well as the other twenty survivors just mentioned, was not asked what he might have observed with regard to these bearings.

He was, however, asked the same question (page 27) that was asked of the others: whether he had "anything to lay to the charge of any officer or man," and answered, "No, sir; nothing."

These men were under no constraint to answer other than according to their consciences, and it is to be remembered that they were on oath. It may be said that they were not questioned as to what they might possibly know with regard to these bearings, because they were not supposed to be competent judges of the matter. They were, however, considered competent to judge of the conduct of the officers, for were they not asked, not only if they had any charge to make against any officer, but *how* the officers performed their duties? It must be admitted that it is quite possible that any one of these survivors might have given positive, as they all certainly did give negative, testimony favorable to the navigator, if it had only occurred to Admiral Rowan or to either of the other two members of the court, Admirals John Rodgers and Wyman, to ask any question with regard to these back-bearings before bestowing censure upon an officer whom death alone had rendered defenseless in their hands.

* Letter of January 8, 1878, now Senate Doc. No. 37.

† The conversation held between Ensign Young and Lieutenant Palmer after the vessel struck and while they were engaged in burning signals.—F. A. P.

I call attention here to question 7 by the court, on page 19, and the answer that follows it.

Engineer Edgar T. Warburton, a survivor, wrote to the "United Service" of January, 1879, a graphic description of the disaster. I quote from his account the following paragraph:

"Unfortunately Commander Ryan, accompanied by Lieutenant Palmer and six or eight men, took position in the launch in the starboard waist, not for the purpose of lowering the boat and deserting the ship, which motive has been basely imputed to these gallant men, but because the situation, though dangerous, commanded a view of the scene; furthermore, the boat was in her cradles, the gripes made fast, and the falls detached."

It is to be observed that it was no ignorance of what his duty was, nor any error of judgment as to the manner of performing it, of which the navigator was accused by the court of inquiry; but, in the face of direct evidence to the contrary, he was "found" to have neglected a simple duty, with which it is well known he was perfectly familiar and had never been known to have neglected.

I do not fall back upon the just assumption of the well-known rule of evidence, "Everything is presumed to be rightly and duly performed until the contrary is shown," although in the absence of witnesses that ought to have been his shield; but I rest his defense on the affirmations of survivors as contained in the record.

The court of inquiry found that these bearings were not taken, and, *by not taking them*, the navigator was held by it to be in part "responsible" for the loss of the ship and—one hundred lives.

But this strange misunderstanding of, this illogical deduction from the testimony of witnesses by this court, was not confined to the particular case in question. In pointing it out it becomes only right to call attention to another most singular misinterpretation of a witness.

On page 27 of the record, Prof. Benjamin F. Greene* testifies before the court as follows: "I made, but did not furnish to the commander of the Huron, observations of horizontal and vertical force to determine the effect of the ship's heeling and the other magnetic elements of the ship."

On page 34 of the record, in the finding of the court, we read: "The court finds that the deviation of the compasses was carefully established by Benjamin F. Greene, * * * and that these deviations were furnished to the commander of the Huron in a tabulated form for each point of the compass [for horizontal and heeling variations]."

Thus the court misinterpreted and directly contradicted this witness.

On page 27, Professor Greene explains his omission to give the heeling error to Commander Ryan in this way:

"The reason for not furnishing the result of these observations to the Huron was that the heeling coefficient was so small," &c.

On page 28 this same witness was asked by the court: "In heeling ten degrees to starboard, what would be the deviation of the Huron's standard-compass upon a course of south by east, three-quarters east?" Answer. "4°.2 west from the magnetic meridian." Can a heeling error of 4°.2 be considered "so small" that there was no reason for furnishing it? This, however, passed quite unnoticed by the court.

I think it right to publish the following letter in evidence of the estimation in which Lieutenant Palmer was held by the Navy Department after fifteen years in the service, which he entered at the age of fourteen.

NAVY DEPARTMENT,
Washington, D. C., December 5, 1877.

SIR: It would be unbecoming in me to intrude upon the domestic privacy of yourself and family when I know that your hearts are torn with terrible affliction, were it not that my official relation to your dear son will justify me in tendering to you my heartfelt condolence at the sad bereavement with which you have been visited.

His official character was above reproach. His manly and honorable deportment was always such as to commend him to the highest consideration of the Navy Department and all his official associates. His devotion to duty gave the amplest assurance of rapid promotion and future usefulness in the service, and it gives me pleasure to add that his private virtues, mellowed by the emotions of a kind heart and generous nature, were universally recognized by his many friends.

Under these circumstances I cannot refrain from communicating to you, in this form, the high appreciation in which he was held by this Department, and to assure you of the sympathy of all its officers. And I hope you will permit me to say that although the highest personal and official merit is not sufficient to ward off the shaft of

* Professor of mathematics, United States Navy, attached to the Bureau of Navigation and in charge of the compasses of the Navy.

death, yet when it finds the victim standing courageously at the post of duty* we have the consolation left that a kind Providence is never forgetful of individual merit, and even while it afflicts, reminds us that the treasury of Divine love is inexhaustible.

Very truly yours,

R. W. THOMPSON,
Secretary of the Navy.

Surg. Gen. JAMES C. PALMER,
United States Navy, Washington, D. C.

But this young officer whose official character has just been described as "above reproach" by the head of the Navy Department, was condemned by the court of inquiry, after death had sealed his lips to his own defense, to leave his children the sad inheritance that he "neglected his duty;" without any evidence that the very duty in question had not been faithfully performed—in contradiction of the opinion of one survivor and the sworn statement of the other.

Individual merit, even though supported by an irreproachable record, can do little to dispute the justice of a conclusion which was given to the world by a court composed of three gentlemen of advanced age and high rank in the Navy; and, although it is a fact that the proceedings of the court were never officially approved by Secretary Thompson, no reversal of its judgment has ever gone forth from the Navy Department.

Let it not be supposed that all the facts of the case have not been many times laid before the Department during this long interval. Over and over again has this matter been brought to its notice, and every argument in favor of justice to the dead been urged without avail.

The unintermitting efforts of Surgeon-General Palmer to obtain from the Navy Department, in behalf of his son, a reversal of the judgment of the court, in view of the manifest injustice of its finding, or the reopening of the case by the convening of another court, or even by the reconvening of the same, were put an end to by his death, which occurred in April of this year.

In publishing these papers, I desire nothing but to establish the fact that the back-bearings of Currituck light were, undoubtedly, carefully and thoroughly taken; that my husband's memory may be cleared of the only reflection ever cast upon it; that that justice may be accorded him by his fellow-officers and others, whose good opinion he would have valued, which has been denied him by the court of inquiry and the Navy Department.

FANNY ASHHURST PALMER.

[*Note.*—Exhibit B consists of a diagram, showing the course of the "Huron" upon lines assumed to agree with the testimony, and a paper containing an analysis of the evidence relating to her proper course and to variations therefrom, which are alleged to have caused the catastrophe.]

NAVY DEPARTMENT,
Washington, December 15, 1883.

SIR: I have to acknowledge the receipt of your letter of the 30th ultimo, with the accompanying papers, relative to the finding of the court of inquiry which was convened in December, 1877, to investigate the facts connected with the loss of the U. S. S. Huron.

The court found that the commander of the Huron was primarily responsible for her grounding and loss, and that the navigating officer was also responsible for not taking back-bearings after the vessel passed Currituck light.

Having carefully considered the papers and remarks submitted with your letter, I have to state that while there appear to be reasonable grounds for the conclusion reached by you, namely, that the back-bearings in question were actually taken, the Department cannot, properly, after this lapse of time, reopen the case with a view of reversing or modifying the finding of the court.

Your letter, however, together with the paper accompanying it over the signature of Mrs. Palmer, will be printed in the Department's annual report, and I will thank you to communicate this fact to the family of the late Lieutenant Palmer.

Very respectfully,

WM. E. CHANDLER,
Secretary of the Navy.

Hon. GEORGE M. ROBESON,
1323 Sixteenth street, Washington, D. C.

* He was a good swimmer, so it is to be inferred he might have reached the shore as others did. He remained by the side of his commander, to whom he was much attached, until they were both washed away; and his hand was disabled so that swimming was impossible, as Michael Trainor testified to Surgeon-General Palmer. His surviving messmates said of him, "He was doing his duty."

No. 10.—NECROLOGY, 1883.

DEPARTMENTAL OFFICERS.

GUSTAVUS VASA FOX.

Born June 13, 1821, at Saugus, Mass.; appointed a midshipman in the Navy from Massachusetts, January 12, 1838; promoted to passed midshipman May 20, 1844; promoted to master August 29, 1851; promoted to lieutenant July 9, 1852. Resigned July 10, 1856.

At the commencement of the civil war was commissioned Assistant Secretary of the Navy, from the 9th of May, 1861, and continued as such until November 26, 1866, on which date the office expired.

Died at New York on the 29th of October, 1883, and was buried in Rock Creek Cemetery, Washington, D. C.

WAR SERVICES.

Served on board the brig Washington during the war with Mexico; was present at the second attack on Tabasco. Upon the breaking out of the war of the rebellion was given command of an expedition to reinforce Fort Sumter, but arrived at Charleston too late to do anything more than bring Major Anderson's party north after their surrender. Commanded steamer Yankee on Chesapeake Bay until appointed Assistant Secretary of the Navy, May 9, 1861.

His knowledge of naval affairs enabled him to fill this important position most effectively. He planned the capture of New Orleans and the opening of the Mississippi, and generally the operations of the Navy throughout the entire war.

DISTINGUISHED PEACE SERVICE.

After the close of the War of the Rebellion, Mr. Fox, while still Assistant Secretary of the Navy, was sent on a special mission to Russia, in the United States steamer Miantonomoh, to present Emperor Alexander II the congratulations of Congress on his escape from assassination.

WILLIAM FAXON.

Born April 17, 1822, and died at Hartford, Conn., on the 19th September, 1883.

Mr. William Faxon, appointed chief clerk Navy Department 19th March, 1861, and when Mr. Fox left on his special mission to Russia was appointed Assistant Secretary of the Navy, on the 1st June, 1866, and resigned his office on March 3, 1869.

NAVAL OFFICERS.—LINE.

REAR-ADMIRAL JOSHUA R. SANDS, U. S. N.

Born in Brooklyn, N. Y., May 13, 1795; appointed in the Navy June 18, 1812; died at Baltimore, Md., October 2, 1883. Total sea service, 21 years 7 months; total time in the Navy, 71 years 4 months.

WAR RECORD.

War of 1812.—Served on board Commodore Chauncey's ship *Oneida* in the attack on Kingston, Lake Ontario, November, 1812; also at capture of Little York (Toronto) April 27, 1813; present and took part in capture of Fort George, Niagara River, town of Newark and its dependencies; May 27, 1813, took part in various engagements with British squadron, particularly that of September 25, when serving on board the *General Pike*.

War with Mexico, 1846.—Served under Commodores Perry and Connor; commanded steamer *Vixen* at Alvarado, Tampico, Tabasco, Laguna, and Tuxpan; 1847, at Vera Cruz, covered landing of troops; engaged batteries at Point Hornos. In company with U. S. S. *Spitfire* and gunboats attacked the fortress of St. Juan de Ulloa; shortly afterwards returned to Washington with dispatches and trophies.

DISTINGUISHED PEACE SERVICE.

Commanded frigate *St. Lawrence* when she attended the World's Fair in England in 1851; assisted in laying transatlantic submarine telegraph cable; engaged in the pursuit of pirates on the coast of Peru in 1823 and also in 1837. Commanded the American squadron on the coast of Brazil from 1859 to 1861.

REAR-ADMIRAL STEPHEN D. TRENCHARD, U. S. N.

Born in the State of New York July 10, 1818; appointed an acting midshipman in the Navy October 23, 1834; died in New York City November 15, 1883. Total sea service, 28 years 1 month; total time in Navy, 49 years.

WAR RECORD.

War of 1861-'65.—Took part in both attacks on Fort Fisher, December, 1864, and January, 1865.

REAR-ADMIRAL J. BLAKELEY CREIGHTON, U. S. N.

Born in the State of Rhode Island March 12, 1822; appointed an acting midshipman in the Navy February 10, 1838; died at Morristown, N. J., November 13, 1883. Total sea service, 22 years 6 months; total time in Navy, 45 years 8 months.

War of 1861-'65.—From August 8 to 23, 1863, attacking batteries Wagner and Gregg, Morris Island, S. C., while in command of U. S. S. *Mahaska*.

REAR-ADMIRAL EDWARD MIDDLETON, U. S. N.

Born in the State of South Carolina December 11, 1810; appointed acting midshipman in the Navy July 1, 1828; died at Washington, D. C.,

April 27, 1883. Total sea service, 22 years; total time in Navy, 54 years 6 months.

WAR RECORD.

Served as executive officer on board of the U. S. S. Decatur in operating against a combination of hostile Indians of the various tribes of Washington and Oregon Territories during the war of the winter of 1855-'56, particularly on the occasion of the attack upon Seattle, Washington Territory, on January 26, 1856.

REAR-ADMIRAL B. F. SANDS, U. S. N.

Born in Maryland February 11, 1812; appointed a midshipman in the Navy April 1, 1828; died at Washington, D. C., June 30, 1883. Total sea service, 24 years 1 month; total time in the Navy, 54 years 11 months.

WAR RECORD.

Mexican War.—Passage up Tabasco River and attack on Tabasco, June 15, 1847.

War of 1861-'65.—Engagement with Fort Caswell, February 23, 1863; bombardment of Fort Fisher on December 24 and 25, 1864; same, on January 14, 15, and 16, 1865; blockade off Wilmington from November, 1862, to February, 1865; blockade off Galveston from February to July, 1865.

REAR-ADMIRAL THOMAS TURNER, U. S. N.

Born in the District of Columbia December 23, 1808; appointed a midshipman in the Navy April 21, 1825; died at Glen Mills, Pa., March 24, 1883. Total sea service, 21 years 11 months; total time in the Navy, 57 years 11 months.

WAR RECORD.

Mexican War.—Served at Tuxpan April 7, 1847.

While serving on board the frigate Columbia, was engaged in the attack upon Quala Bato and Mucke, island of Sumatra, January 1, 1839.

War of 1861-'65.—At Charleston, S. C., April 7, 1865.

While in command of the Saratoga, took part in the engagement between that vessel and the two Spanish steamers Marquis of Havana and General Miramon, in the harbor of Anton Leyardo (Mexico), when they were captured, March 6, 1860, at 12 o'clock at night.

COMMODORE SIMON B. BISSELL, U. S. N.

Born in Vermont, October 28, 1808; appointed an acting midshipman March 1, 1825; died in Paris, France, February 18, 1883. Total sea service, 17 years 2 months; total time in Navy, 57 years 8 months.

WAR RECORD.

War with Mexico.—In the naval battery during siege of Vera Cruz.

COMMODORE WILLIAM N. JEFFERS, U. S. N.

Born in New Jersey, October 16, 1824; appointed a midshipman in the Navy September 25, 1840; died at Washington, D. C., July 23, 1883. Total sea service, 19 years 1 month; total time in Navy, 43 years 1 month.

WAR RECORD.

War with Mexico.—Attack on Alvarado; capture of Tabasco; attack of Mosquito fleet on castle of San Juan d'Ulloa and city of Vera Cruz;

capture of Tuxpan, Tampico, and various skirmishes while attached to the U. S. S. Vixen; engagement with Paraguayan fort, Parana River.

War of 1861-'65.—Battle and capture of Roanoke Island; Elizabeth City; capture of the enemy's squadron, and numerous skirmishes at various points in Pamlico and Albemarle Sounds; attack on batteries at Sewell's Point, Harden's Bluff, and Drury's Bluff.

Was Chief of Bureau of Ordnance from April 10, 1873, to June 30, 1881.

CAPT. BUSHROD B. TAYLOR, U. S. N.

Born in Indiana, March 31, 1832; appointed a midshipman in the Navy April 3, 1849; died at Washington, D. C., April 22, 1883. Total sea service, 17 years; total time in Navy, 34 years 1 month.

WAR RECORD.

War of 1861-'65.—Rebel field-battery at Harrison's Landing, July, 1862; rebel batteries on Saint John's River, Florida, November, 1862.

COMMODORE J. M. BERRIEN, U. S. N.

Born in New Jersey, December 28, 1804; appointed a midshipman March 1, 1825; died in Philadelphia November 21, 1883. Total sea service, 16 years 2 months; total time in Navy, 57 years 8 months.

WAR RECORD.

Mexican War.—Commanded the schooner Bonito at the capture of Tabasco, June 16, 1847.

CAPT. SAMUEL R. KNOX, U. S. N.

Born in Massachusetts, August 28, 1811; appointed a midshipman April 1, 1828; died at Everett, Mass., November, 1883. Total sea service, 17 years 3 months; total time in the Navy, 55 years 7 months.

WAR RECORD.

Mexican War.—Vera Cruz, Tuxpan.

War of 1861-'65.—Attack of batteries at Galveston, August, 1861; engagement with two rebel steamers at the Head of the Passes, Mississippi River, November, 1861.

COMMANDER FRANCIS MORRIS, U. S. N.

Born in the State of New York, July 13, 1844, and was appointed an acting midshipman in the Navy September 27, 1860; he died at Newport, R. I., on the 12th of February, 1883. Total sea service, 10 years 2 months; total time in the service, 22 years 3 months. He was present at both attacks upon Fort Fisher.

COMMANDER C. H. CUSHMAN, U. S. N.

Born in the State of Maine, on the 6th December, 1831; appointed a midshipman in the Navy March 24, 1849; died November 11, 1883. Total sea service, 15 years 1 month; total time in Navy, 33 years 9 months.

WAR RECORD.

Took part in skirmishes of U. S. S. Massachusetts with steamers and fort Ship Island, July and August, 1861; battle of Port Royal and skirmishes from November 7, 1861, to August 10, 1862; battle of Charleston, April 7, 1863; same, July 10 to 28, 1863; advance on James River, May 5 to October 28, 1864; attack on Fort Fisher, December, 1864, and again January, 1865; assault on Fort Fisher, January 15, 1865; wounded at the assault on Fort Fisher, left leg, above and below the knee.

LIEUTENANT-COMMANDER CHARLES F. SCHMITZ, U. S. N.

Born in Indiana November 20, 1843; appointed a midshipman in the Navy October 19, 1861; died May 20, 1883, at Mare Island, California. Total sea service, 8 years 10 months; total time in Navy, 21 years 2 months.

LIEUT. SAMUEL F. CLARKSON, U. S. N.

Born in the State of New York, October 11, 1845; appointed an acting midshipman in the Navy September 20, 1862; died at Nice, France, January 8, 1883. Total sea service, 10 years 10 months; total time in Navy, 20 years 3 months.

LIEUT. CHARLES SEYMOUR, U. S. N.

Born in the State of New York, April 19, 1847; appointed an acting midshipman in the Navy July 28, 1864; died March 10, 1883, at Charlestown, Mass. Total sea service, 8 years 11 months; total time in Navy, 18 years 5 months.

LIEUT. HENRY L. GREEN, U. S. N.

Born in the State of New York, March 16, 1849; appointed a midshipman in the Navy July 31, 1866; died at Naval Academy, Annapolis, Md., July 7, 1883. Total sea service, 8 years 9 months; total time in the Navy, 17 years.

LIEUT. FRANK W. NABOR, U. S. N.

Born in the State of Ohio, on the 20th February, 1850; appointed a midshipman in the Navy September 21, 1867; died August 23, 1883, at Pasadena, Cal. Total sea service, 7 years 7 months; total time in Navy, 15 years 3 months.

LIEUT. BOUTELLE NOYES, U. S. N.

Born in the State of Maine, January 10, 1848; appointed a midshipman in the Navy September 26, 1864; died from result of injuries received on board U. S. S. Richmond at Yokohama, August 29, 1883. Total sea service, 12 years 1 month; total time in Navy, 18 years 11 months.

LIEUT. ALBERT T. FREEMAN, U. S. N.

Born in the State of Pennsylvania, August 15, 1851; appointed a midshipman in the Navy September 24, 1868; died at Camden, N. J., October 11, 1883. Total sea service, 7 years 5 months; total time in Navy, 14 years 3 months.

ENSIGN HERBERT J. ROBINSON, U. S. N.

Born in the State of New Hampshire, February 19, 1859; appointed a cadet midshipman in the Navy September 15, 1875; died at naval hospital, Chelsea, Mass., June 19, 1883. Total sea service, 2 years 1 month; total time in Navy, 7 years 3 months.

MEDICAL CORPS.

MEDICAL DIRECTOR JAMES C. PALMER, U. S. N.

Born in Maryland, June 29, 1811; appointed in the Navy March 26, 1834; died at Washington, D. C., April 24, 1883. Total sea service, 17 years; total time in Navy, 49 years 7 months.

WAR RECORD.

Mexican War.—Tampico, Vera Cruz.

War of 1861-'65.—Mobile Bay, August 5, 1864, and subsequent operations.

SURGEON ALFRED M. OWEN, U. S. N.

Born in Pennsylvania, September 10, 1846; appointed in the Navy, May 20, 1869; died at navy-yard, Pensacola, Fla., August 22, 1883. Total sea service, 6 years 7 months; total time in Navy, 14 years 2 months.

PAY CORPS.

PAY DIRECTOR EDWARD C. DORAN, U. S. N.

Born in Pennsylvania, December 25, 1820; appointed in the Navy, September 15, 1845; died at Nice, France, October 30, 1883. Total sea service, 11 years 7 months; total time in Navy, 38 years 1 month.

PAY DIRECTOR C. C. JACKSON, U. S. N.

Born in the State of New York, August 27, 1814; appointed, July 17, 1857; died at Detroit, Mich., June 27, 1883. Total sea service, 6 years 2 months; total time in Navy, 25 years 11 months.

PASSED ASSISTANT PAYMASTER C. I. LEWIS, U. S. N.

Born in Pennsylvania, August 16, 1853; appointed assistant paymaster, June 23, 1877; died at Frankfort, Ky., August 8, 1883. Total sea service, 3 years 2 months; total time in Navy, 6 years 1 month.

PASSED ASSISTANT PAYMASTER Z. T. BROWN, U. S. N.

Born in Rhode Island, April 28, 1847; appointed assistant paymaster, June 13, 1870; died at navy-yard, Pensacola Fla., August 29, 1883. Total sea service, 5 years 8 months; total time in Navy, 13 years 2 months.

ENGINEER CORPS.

CHIEF ENGINEER W. H. KING, U. S. N.

Born in North Carolina, December 1, 1837; appointed in the Navy, May 20, 1857; died at San Francisco, March 11, 1883. Total sea service, 14 years 6 months; total time in service, 25 years 9 months.

CHIEF ENGINEER O. H. LACKEY, U. S. N.

Born in Virginia, March 8, 1837; appointed in the Navy, July 21, 1858; died at Washington, D. C., May 21, 1883. Total sea service, 16 years 3 months; total time in the Navy, 24 years 10 months.

WAR RECORD.

War of 1861-'65.—Port Royal, November 7, 1861; Charleston, April 9, 1863.

PASSED ASSISTANT ENGINEER J. G. BROSNAHAN, U. S. N.

Born in the State of New York, May 25, 1839; appointed, June 10, 1862; died at New York, January 12, 1883. Total sea service, 12 years 1 month; total time in the Navy, 20 years 7 months.

WAR RECORD.

War of 1861-'65.—Stono River, July 16, 1863; Stono Inlet, December 25, 1863; Battery Pringle; Coosahatchie River, December 4, 5, 6, 1864; Tagoda Creek, February 9, 1865. Wounded in right arm at Bull Run, while in the Army.

ASSISTANT ENGINEER NELSON ROSS, U. S. N.

Born in the State of New York, December 14, 1839; appointed in the Navy, July 8, 1862; died at Fort Covington, Ky., August 6, 1883. Total sea service, 5 years 3 months; total time in Navy, 21 years 1 month.

WAR RECORD.

War of 1861-'65.—Fort Pringle; almost all the operations against Charleston, especially those on Stono and Folly Rivers and Light-House Inlet.

NAVAL CADET PETER MILLER, U. S. N.

Born in Sweden, February 5, 1860; appointed in the Navy, October 1, 1878; died on board U. S. S. Tennessee on April 3, 1883. Total sea service, 1 year 4 months; total time in Navy, 4 years 7 months.

CONSTRUCTOR.

NAVAL CONSTRUCTOR EDWARD HARTT, U. S. N.

Born in New Hampshire, January 2, 1825; appointed in the Navy, November 27, 1861; died at Watsesing, N. J., September 12, 1883. No sea service; total time in Navy, 21 years 7 months.

WARRANT OFFICERS.

BOATSWAIN J. SHEPPARD, U. S. N.

Born in Pennsylvania, December 25, 1840; appointed, March 8, 1877; died at navy-yard, Pensacola, June 29, 1883. Total sea service, 1 year 1 month; total time in Navy, 6 years 4 months.

BOATSWAIN T. G. BELL, U. S. N.

Born in North Carolina, July 3, 1810; appointed, June 18, 1838; died at Seacliff, L. I., August 10, 1883. Total sea service, 13 years 4 months; total time in Navy, 45 years 1 month.

GUNNER EUGENE MACK, U. S. N.

Born in Ireland, June 1, 1822; appointed a gunner in the Navy September 10, 1849; died at Somerville, Mass., July 25, 1883. Total sea service, 12 years 7 months; total time in Navy, 33 years 10 months.

CARPENTER C. F. HUMPHRIES, U. S. N.

Born in the State of New York, November 15, 1845; appointed, June 17, 1869; died at Camden, N. J., January 8, 1883. Total sea service, 6 years 6 months; total time in Navy, 13 years 3 months.

CARPENTER W. D. JENKINS, U. S. N.

Born in the State of Maine, November 14, 1808; appointed, March 24, 1840; died at Flatbush, N. Y., April 14, 1883. Total sea service, 16 years 4 months; total time in Navy, 43 years.

SAILMAKER W. ROGERS, U. S. N.

Born in New York, May 13, 1825; appointed, October 17, 1857; died at Brooklyn, N. Y., February 20, 1883. Total sea service, 11 years 1 month; total time in Navy, 25 years, 3 months.

WAR RECORD.

War of 1861-'65.—Port Royal; Mobile Bay.

MATE CHARLES J. BIBBER, U. S. N.

Born in the State of Maine; appointed a mate in the Navy, March 1, 1865; died at Revere, Mass., October 8, 1883. Total sea service, 5 months; total time in Navy, 17 years 10 months.

MARINE CORPS.

CAPT. N. L. NOKES, U. S. M. C.

Born in Washington, D. C., April 3, 1841; appointed, November 1, 1861; died on board U. S. S. Hartford, at Corinto, Nicaragua, October 7, 1883. Total sea service 8 years 3 months; total time in Navy, 21 years 10 months.

FIRST LIEUT. G. M. WELLS, U. S. M. C.

Born in the State of New York; appointed, July 14, 1862; died at Fort Dodge, Iowa, October 18, 1883. Total sea service, 2 years 9 months; total time in Navy, 21 years 4 months.

No. 11.—BUREAU OF YARDS AND DOCKS.

BUREAU OF YARDS AND DOCKS,
NAVY DEPARTMENT,
Washington, D. C., October 26, 1883.

SIR: In compliance with your order of the 13th instant, I have the honor to submit herewith my annual report for the fiscal year ending June 30, 1883, and estimates for the fiscal year ending June 30, 1885, together with an abstract of offers for supplies coming under the cognizance of the Bureau of Yards and Docks for the fiscal year ending 30th June, 1883.

I am, with great respect, your obedient servant,
ED. T. NICHOLS,
Chief of Bureau.

Hon. WM. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

BUREAU OF YARDS AND DOCKS,
NAVY DEPARTMENT,
Washington, D. C., October 26, 1883.

SIR: The following report of the operations of this Bureau, for the fiscal year ending June 30, 1883, and estimates for the fiscal year ending June 30, 1885, is respectfully submitted.

NAVY-YARD, PORTSMOUTH, N. H.

The total expenditure at this yard for labor and material under the two heads of appropriation, viz, "general maintenance" and "repairs and preservation," has been \$51,338.09. This amount has been expended in the ordinary, every-day, constant care of the vast amount of public property contained within its limits, and I have every reason to believe, has been as judiciously expended as possible.

The water system at this yard is very deficient. It is mainly dependent upon two small ponds on Seavey's Island, which, in turn, are mainly dependent upon rains.

In consequence of the limited amounts available for the work of the yard proper, it has been impossible to give requisite care and attention to these ponds, and they are now so filled with the washings of the surrounding hills, grass, weeds, &c., that their depth is seriously impaired and their superficial area enlarged, thus increasing the loss by evaporation.

The steam generators supplying power for all mechanical purposes in the yard, are supplied with water from these ponds. This supply is now only adequate to meet the demands in ordinary times, and should

an emergency arise requiring the full force of the machinery of the yard, we would find ourselves very much embarrassed for water. It is proposed to clean out and enlarge the capacity of these ponds. and an appropriation is asked for this purpose.

NAVY-YARD, BOSTON, MASS.

The total expenditure at this yard for the fiscal year ending June 30, 1883, has been \$76,679.98, and has been as carefully administered as possible. Under the limited amount available for repairs, it has been impossible to prevent deterioration, and there is scarcely a building or public work of any character in the yard that is not sadly in need of attention.

The enforced economy (?) of the past few years is rapidly accumulating a heavy bill of expenses, if the yards are to be maintained, and rapidly deteriorating the value of the property if to be disposed of.

In addition to the ordinary estimates for current expenses, estimates are also presented for works of improvement, considered necessary to the efficiency of the yard, and, indeed, under the heads of "general maintenance" and "repairs and preservation," there is ample field for the employment of much more than has heretofore been allotted (for the past few years) from the small appropriations under those heads to that yard. The works of improvement as estimated for are considered necessary, if this yard is to be retained.

NEW LONDON NAVAL STATION.

The expenditures at this place have been comparatively small and almost entirely in the direction of "maintenance." Those for repairs have been no more than were absolutely necessary for the care of the property. For naval purposes it is absolutely necessary that the water front of this valuable property should be protected by a quay wall, and I respectfully renew my recommendation of the past two years for an appropriation for this purpose. It is understood that the New York and New England Railroad Company, having made a survey through this property, have applied for a grant of the right of way therefor. If this right of way is conceded, it will, in my opinion, be fatal to its usefulness for naval purposes. The property is a comparatively narrow strip of land bordering on the river, and a railroad traversing this strip from end to end would effectually destroy all chances for building dry-docks, railways, building ships or wet-basins, besides being a source of danger to the employes of the yard.

This land was ceded to the General Government by the State of Connecticut for naval purposes, and it is believed that even Congress cannot divert it to any other use without alienating the gift. If it is not to be developed, I would recommend, in the interest of economy, that all the movable property be transferred to other yards, or sold, the administration broken up, and the fixed property left in care of one person, who will reside upon it.

NAVAL STATION, SACKETT'S HARBOR.

One man has been employed as shipkeeper and watchman during the year, at a total cost of \$702.86. After the old ship New Orleans is sold and removed there will be no necessity for his retention. One of the

two houses on the property is in fair condition, and it is believed that the privilege of occupying this house would be ample compensation for the care of the property.

NAVY-YARD, NEW YORK.

The appropriation for the fiscal year ending June 30, 1883, contained an item of \$150,000 for "dredging caisson and intercepting sewer." Under the first item work was carried on to the extent of removing upwards of 100,000 cubic yards of material, at a cost of \$28,289.24. It was originally contemplated to use a portion of this appropriation in constructing a new caisson gate for the dry dock, but in view of the prospectively large amount that would be required for the contemplated sewer, it was deemed advisable to thoroughly repair the old caisson, which has been done at a cost of \$20,804.65, and it is now in condition to last many years with care. Work upon the intercepting sewer, designed to divert to the East River the sewerage emptied into the Wallabout channel, near the entrance of the dry dock, was commenced by Mr. Charles Hart, of Brooklyn, January 3, 1883, to whom the contract was awarded after the failure to qualify by lower bidders.

This work has been prosecuted under many difficulties, mainly the inclemency of the winter weather, and the necessity of modifying from time to time the original plans and specifications as the nature of the soil demonstrated. At the end of the fiscal year this work had made very satisfactory progress, and at the present time is virtually completed, and the sewerage will soon be diverted to the East River, and the sum appropriated for dredging in the present fiscal year will be available.

The buildings and other public property in this yard have been as well cared for as the very limited and inadequate appropriations would admit of. With so many objects needing attention, the Bureau and the authorities of the yard have been much perplexed as to the best disposition to be made of the funds at their disposal. Repairs to a greater or less extent have been made upon forty buildings, besides various other objects, as wharves, sewers, roads, fences, walls, gutters, drains, water and gas service, sheers, cranes, dry-dock, &c., in many instances mere patchwork or makeshifts, where the best interests of the Government required renewal. The system is resulting, and must continue to result, in the rapid deterioration of the public property, rendering necessary at no very distant day a heavy outlay to restore the yard to a condition of usefulness.

In addition to the estimates for general maintenance and repairs and preservation, I respectfully renew my recommendation of last year, viz: For "yards and docks building," "boiler shop, wing to new machine shop" (a very important object in view of the prospective liberality of Congress in creating a new Navy), "shipwright's shed," "paint shop," an additional appropriation for dredging and for new caisson for dry-dock. The swinging gates of the dry-dock are gone beyond repair. I would not assume the responsibility of using them. A new pair, or an additional caisson, are absolutely necessary.

NAVY-YARD, LEAGUE ISLAND, PA.

The expenditures at this yard have been mainly in the direction of care and preservation of the dikes and such minor repairs upon buildings, roads, bridges, &c., as were possible with the limited funds.

On the supposition that League Island is to be retained as a navy-yard, the estimates of last year are respectfully renewed.

NAVY-YARD, WASHINGTON, D. C.

The dredging of the channel from the Potomac River to the navy-yard has been the only work of improvement of any importance during the year. Notwithstanding the delay in building the dumping-scows and putting the dredger in good working condition, the work of dredging was commenced on October 20, 1882, and has been continued, with many interruptions from breakages of machinery, encountering of wrecks, &c., up to the present time. The total excavation to July 1, 1883, has been 74,457 cubic yards, of which 63,602 cubic yards have been in the main channel. A channel 65 feet wide at the bottom, with a depth of 18 feet at low water, has been secured through the bar extending from the old channel to Buzzard's Point. In January, 1883, a board of officers was appointed by the honorable Secretary of the Navy to examine and report upon a plan of Civil Engineer A. G. Menocal, U. S. N., for the permanent improvement of the Eastern Branch. This Board, in its report (a printed copy of which accompanies this), very strongly approved this plan. It is proposed to ask for an appropriation of \$25,000 for the continuation of dredging, unless it shall be decided to adopt the plan recommended by the Board, in which case the sum of \$60,000, plus any unexpended balance from present appropriation, will be required.

Plans and estimates for a building suitable for an ordnance machine-shop have been submitted heretofore, and are again submitted. In consequence of the weak and dangerous condition of the present building from settling, and consequent bulging and cracking of the walls, it became necessary to reduce the weight resting on them by the entire removal of the upper story, with its accumulation of stores, machinery, &c., thus very materially reducing the space necessary for carrying on the operations of the Department.

For several years past there has been embodied in the annual report a recommendation for the purchase of squares 853 and 826, adjoining the navy-yard property on the west. The gradual filling in of the marsh on this side affords easy access to the navy-yard, the only protection being a wooden fence extending across the dry ground to the swamp. This border of the yard should be protected by a substantial brick wall, but as this wall would pass directly through the marsh, it must necessarily have a pile foundation, adding considerably to the expense. As this navy-yard will probably be no more than a manufacturing establishment in the future, I am of opinion that it now contains all the land it requires.

NAVY-YARD, NORFOLK, VA.

An appropriation of \$5,000 was made for the construction of two cisterns of this yard. These cisterns were completed within the fiscal year, are now in use, and supplying a long-felt want. No other improvements have been made, and the other expenditures have been kept within the smallest possible limits, the reduced appropriations rendering it impossible to even properly care for the public property.

In view of the possible abandonment of one or more of the other navy-yards, the importance of this one cannot be overestimated; and to make its usefulness approximate to its importance, it would seem necessary to increase its area, but if this is not deemed advisable, many improvements are necessary within its present area, among which, and perhaps

most important, is the extension of the quay wall. The extension of the present dry dock is also an important measure, as will be seen by the following figures: Extreme length of dock, 341 feet; extreme length of new cruiser Chicago, 342 feet; extreme length of Tennessee, 375 feet, neither of which vessels can by any possible means be placed in the dock. In this connection it is recommended that in case of extension of this dock, provision should be made for new pumps, engine-house, &c.

A marine railway is a necessary adjunct to this yard, and in case of the extension of the dry-dock as recommended will be of the greatest importance.

The extension of the railroad system of the yard is of great importance. Coal house No. 54 is also needed.

The above items are selected from those embraced in the annual estimates of the civil engineer of the yard as of the most importance under the head of improvements, though a design to place this yard on a first-class basis would necessarily include all of them.

PENSACOLA NAVY-YARD.

An appropriation of \$150,000 for the improvement of this yard was made available July 1, 1880, and to July 1, 1883, there had been expended of this appropriation the sum of \$149,007.71, leaving a balance of \$992.24 to lapse into the surplus fund of the Treasury. July 1, 1881, another appropriation of \$75,000 became available to continue the improvement of the yard, of which there remained on hand July 1, 1883, a balance of \$15,141.36. Out of the balance of the first appropriation there was expended during the last fiscal year \$6,000 in the care and preservation of the first two sections of the iron floating-dock sent to the yard some years since, and out of the last-named appropriation of \$75,000 the necessary expenses attending the care, preservation, towage, wharfage, &c., of the two remaining sections were paid, as also payment for various works of improvement in the yard, including a caisson for dry-dock, costing \$21,034.63, leaving a balance as above stated.

This yard having been declared closed by order of the honorable Secretary of the Navy, under authority of the act of Congress of March 3, 1883, it was deemed advisable to permit this balance to remain in the Treasury unexpended.

During the preceding fiscal year the yard was virtually closed in consequence of the prevalence of yellow fever in and about Pensacola.

There are now at this yard four sections of an iron floating-dock, the construction of which was authorized by acts of Congress approved June 23, 1874, and March 3, 1875. Two of these sections are hauled up on the beach for their better preservation, and the other two are moored in the basin. The machinery, material pertaining to the superstructure, &c., is all stored as carefully as possible in the yard, and its care and preservation is a constant source of anxiety and expense to the Bureau.

To make these four sections available for use, it is estimated, will require about \$70,000, and even then their usefulness will be limited on account of their limited capacity. To make this dock what it ought to be, two additional sections will be necessary, and if it should be decided to build these two additional sections, it is believed that the necessary material can be transported and the sections built at the yard at a less cost than to build them at the North and tow them there.

The future of this yard depends so much upon the final report of the Commission on Navy-Yards, and the action to be taken thereon, that I do not feel justified in making any recommendation.

KEY WEST NAVAL STATION.

The importance of this station is in its convenience to the vessels of the so-called Home Squadron, as a basis of supplies of coal, &c., and its facilities for making minor repairs to machinery. It has a fine storehouse, coal-shed, and moderately efficient machine-shop, and the property is in very fair condition. The water front has an entire length of 850 feet, intercepted, however, by two streets, and by a lot known as the Mallory lot. The purchase of this Mallory lot and the closing of the intercepting streets would add very materially to the value of the Government property, giving it the entire water front. I consider it detrimental to the interests of the Government to have private interests thus interjected into its domain.

The bulkhead along our present water front, originally of mangrove piles, is in a sadly dilapidated condition from the destructive operations of the worm and the sea, and should be immediately renewed, for the preservation of the property. It is proposed to erect a permanent concrete and rock wall along this entire front, and the purchase of the lot and closing of the intercepting streets is not only desirable but important. Estimates for both of these objects are presented.

On June 16, 1880, an appropriation of \$30,000 was made for the repair and renewal of the old wharf at this station. After due and careful inquiry, it was deemed best to replace the old structure with an entirely new iron wharf. Accordingly a contract was made with A. P. Boller & Co., of New York, after public advertisement, for all material and labor required, and work commenced July 1, 1882.

On the 8th July, 1882, in consequence of representations made by the commandant of the station and the superintending engineer, as to the inefficiency and insufficiency of the plant and working force, I ordered operations stopped. The contractor was called upon to comply with the terms of the contract in these respects, but instead of doing so, withdrew his men and plant to New York on or about July 22, 1882. The season was then too far advanced to procure the necessary plant and resume the work, but the time was utilized in collecting from the various navy-yards the necessary appliances and shipping them to Key West, so that on the 4th of January, 1883, work was resumed under the immediate orders of Lieut. Commander J. K. Winn, U. S. N., the commandant of the station, and Civil Engineer R. E. Peary, U. S. N., as superintendent, and prosecuted with great vigor and under very adverse conditions to a successful termination.

The wharf was practically completed at the end of the fiscal year, within the limit of the special appropriation made for the object, and I have every reason to believe is a substantial permanent structure, and I beg here to record my appreciation of the zeal, skill, energy, and ingenuity displayed by the above-named gentlemen in its construction.

MARE ISLAND NAVY-YARD, CALIFORNIA.

The works at this yard for which special appropriations were made were for completion of iron-plating shop; continuation of stone dry-dock, and enlargement of reservoir. Nothing has been done under the first of the above items in consequence of the building being largely occupied for the storage of valuable timber, for which there is no other available place at present. Under the second head valuable progress has been made and good value received for the money expended.

The work of constructing this dry-dock has been energetically carried

on in the face of many obstacles, under trying circumstances, involving great anxiety to and demanding constant vigilance on the part of the civil engineer, Mr. C. C. Wolcott, U. S. N., who, I am pleased to say, has in all cases been found equal to the emergency. The great cause of anxiety has been the condition of the coffer-dam, a structure of perishable material, built upwards of nine years ago, showing very marked signs of its age and decay, demanding constant and careful attention, attended with great expense.

The year's progress on the dock would have made a better showing but for the unfortunate controversy about the awarding of the contract for the granite. Of the quality of the granite furnished, the civil engineer, in his annual report, thus speaks: "The granite is of most excellent quality and of great beauty, though hard to work; in its finished state it cannot be excelled." Although the contract was not awarded until 7th December, 1882, there had been accepted and dressed at the close of the fiscal year 11,216 cubic feet of this granite, much of which is in place in the structure.

Within the present year it is hoped to get the caisson and pumps in place, when the dock will be available for use, though not entirely completed. It is proposed to ask for an appropriation of at least \$500,000 for the coming fiscal year.

In this connection, I beg to call your attention to the remarks of Civil Engineer Wolcott in his annual report upon this work:

The dock is now so near completion and ready for use that it would seem to urge the appropriation of a sum sufficiently large to complete it, and the true economy of construction consists in having available immediately the money to meet all obligations for necessary material, and the constant employment of labor to properly work it. With these conditions filled, the dock can be completed in less than two years, and its use can be anticipated in a much shorter period. The facing of granite can go on while the dock is being used without inconvenience, and I especially urge the appropriation of not less than \$500,000 with which to continue it. The total amount required to complete the dock will be about \$650,000, barring accidents. The great cost is largely due to the use of granite as a facing, and which on this coast is double the price paid for it in the East. The amount appropriated will be expended in the removal of the coffer-dam, the filling, grading, and paving about the dock, and the purchase, dressing, and laying the granite facing of the dock.

In all of which I most cordially concur; and just here it may not be out of place to express the opinion that the recommendations of the gentleman who has shown himself so thoroughly practical and efficient in the conduct of this work since it has been in his charge, and who has prosecuted it with so much energy and skill, are entitled to great consideration.

Under the third head of appropriation for the fiscal year ending the 30th June, 1883, viz, "reservoir," the entire amount has been expended in increasing the capacity of the reservoir to 27,000,000 gallons by excavation. Bids were invited for the work, the lowest received being fifty cents per cubic yard, and time to complete ninety days. This work was performed by the department of yards and docks at a cost of thirty-four cents per cubic yard, and completed in fifty-four working days.

The two past rainy seasons of California have proved remarkable exceptions to the general rule, and the total collection in our reservoir has not amounted to much more than 2,000,000 gallons. I am satisfied that when this reservoir is filled it will become an invaluable adjunct to the usefulness of the navy-yard, and a most important element of safety. We have a contract with the Vallejo City water-works for an annual supply of 12,000,000 gallons of water. The same causes which have operated against the filling of our reservoir, viz, the absence of rain, have operated against this company to such an extent that it has been

compelled to reduce its supply to the navy-yard one-half, and, indeed, since the close of the last fiscal year the navy-yard supply from this source has frequently ceased entirely.

The cistern capacity of the yard is entirely inadequate; mechanical industries are seriously interfered with, and much valuable property is exposed to danger, if not destruction by fire, in consequence of lack of water.

Upon becoming acquainted with this condition of affairs, I, at the earnest suggestion of the civil engineer, indorsed by the commandant, authorized the experiment of sinking an artesian well. After careful examination by Mr. Wolcott, the civil engineer, a spot considered favorable was selected, but before work was begun an expert in artesian-well boring was invited to make an examination, and gives his opinion as to the most favorable place to begin operations. Without any knowledge of what had been done by the civil engineer, this expert reported upon a position in close proximity to that selected by Mr. Wolcott. With this confirmation of Mr. Wolcott's judgment by a disinterested party, I no longer hesitated, but authorized the work to proceed. At the close of the fiscal year a depth of 330 feet had been reached, but without reaching water. This work has not been pushed with the energy its importance deserved, simply for the reason that the necessary funds could not be spared from current appropriations.

The water famine for the past two years in California has awakened attention to the necessity of seeking more assured sources of water supply than the uncertain one of catchment and storage. I am so deeply impressed with the importance, if not absolute necessity of this, that I do not hesitate to recommend and urge an appropriation of \$10,000 for this purpose. The success attending the efforts at the Benicia Arsenal, where water was obtained at depths of 900 and 1,500 feet, is of sufficient encouragement to warrant the asking of this appropriation. The expensive tools, &c., used in this work, are believed to be still on hand, and can no doubt be borrowed, and their use will, in all probability, assure an abundant supply of this so much needed element and save the Government the annual water-tax of from \$5,000 to \$7,000 per year, which it is at present paying.

The roads, walks, gutters, and drains in this yard are sadly in need of attention. The plank roadways laid in 1874 must be renewed or replaced by paving or macadamizing. In the winter, or rainy season, the roads are at times almost impassable for vehicles of any kind, in consequence of the deep mud; transportation is vastly increased in difficulty, and the wear and tear upon stock is ruinous. The defective plans and construction of the sewers render a modification thereof essential. An estimate of \$20,000 is presented for the above objects.

The necessity of a wharf along a portion of the water-front, a distance of about 450 feet, is apparent, and is specially commended as not only of great value to the efficiency of the yard, but also as a means of preserving the deep water and a saving of expense of dredging.

During the fiscal year a mud-bank in front of the coal wharf was effectually removed by a simple process of stirring it up on the ebb tide, so that a vessel drawing 16 feet was enabled to reach the coal wharf, an event that has not occurred before for years. The effect of this wharf, as recommended, with its row of sheet-piling, will straighten the water-front, direct the current in a straight course, and thus obviate the danger of other formations of the same kind.

The wharf adjoining the ferry-slip, the slip itself, the ferry-house,

watch, guard, and freight house demand immediate attention to the extent of rebuilding.

Referring again to the subject of water, I deem it only proper to call attention to the need of more cisterns in the yard. The line of officers' quarters is 450 yards from the water-front, and depends for its protection from fire on a 3-inch water-main, which has a pressure of not more than 10 pounds when the forcing-pump is not in use. The office building, in which the valuable records of the yard are kept, is also 400 yards from water. The danger from fire at this yard is greatly increased over that of other yards, owing to the long-continued dry season, when all the grass, the wood-work of buildings, &c., are thoroughly dried out, and as inflammable as tinder. A fire once started during the absence of the workmen would probably result disastrously. It is recommended that at least seven cisterns should be constructed, and for this purpose an estimate of \$46,000 is presented.

The Mare Island navy-yard being the only one on the Pacific coast, the base of supplies and repairs for the Pacific and China squadrons, its importance cannot be overestimated, and it would seem to be the part of wisdom to place it in first-class condition, ready to do all work it may be called upon for at short notice.

NAVAL ASYLUM, PHILADELPHIA, PA.

There were on the rolls of the asylum July 1, 1882, the names of 194 beneficiaries; 22 were admitted during the year, 18 have died, 7 have been dropped for absence without leave, 1 discharged at his own request, and 1 dismissed for misconduct, leaving 189 on the rolls at the end of the year. This shows a decrease of 5 as compared with the previous year, and is the first instance of a decrease in many years. It is safe to say, however, that the applications for admission are in excess of the vacancies. The term of service entitling to admission is twenty years, but in exceptional cases this rule has been waived. Now, however, the building is so nearly filled to its utmost capacity, I am reluctantly compelled to refuse many worthy and deserving applicants, of less than the prescribed length of service, that there may be room for applicants of full term. The building is now uncomfortably full, many rooms being used as sleeping-rooms, out of necessity, that were never designed for that purpose, being deficient in light and ventilation. I have, on previous occasions, recommended the removal of the asylum to a more suitable location, and I respectfully again call attention to the subject. The thickly settled portion of a large city is plainly no place for an institution of this kind. There is nothing in the surroundings to remind the old men of their former life, or anything in which they take any interest. The institution should be located on or near the sea shore, not so remote from the life and activity of a city, that the old men may not visit it easily, and in sight of passing vessels, so that they may be reminded of occupations and excitements of their former lives. As the selection of a proper site and erection of suitable buildings will necessarily involve some time, it is not considered inconsistent to renew former recommendations for the construction of an addition to the present asylum building. This addition is a necessity. The present building is lacking in many essentials of an institution of its kind, particularly in the matter of bathing facilities. The kitchen and laundry should be located in this new building, and quarters provided in it for the servants. This will give additional rooms in the main building for beneficiaries, admit of the enlargement of the dining-room, now very necessary, and

afford ample space for bath-rooms. The removal of the kitchen and laundry will tend very much to improve the atmosphere of the house; the odors from cooking and washing are scarcely ever absent from it.

The governor of the asylum, in his annual report, uses the following language:

I beg earnestly to recommend the employment of three additional waiters. There are at present but five. Some of the men are blind, and others suffer from various infirmities, requiring at table special attention. Each waiter has now to attend to about thirty-five beneficiaries, a proportion entirely too great for proper service.

I entirely concur in his views; and as this institution is supported from the pension fund, a fund which many of these old men helped to create, it is only right and proper that they should receive all the benefit from it that it is capable of bestowing.

The estimates provide for an increase of pay in the cases of some of the employés, viz, the steward, chief and assistant cooks, master-at-arms, corporal, and matron. The duties of these persons are of the highest importance to the institution, and to the welfare and comfort of the beneficiaries. Persons in all respects suitable and qualified for these positions cannot be obtained for the prices at present paid, and the increase is earnestly recommended. An estimate is also submitted for \$600 for music in chapel. This will pay for the services of organist and singers during the usual Sunday exercises, and allow of an occasional entertainment of some kind. It has been observed that when voluntary entertainments have been given here by kindly-disposed persons from the city, the beneficiaries have attended and manifested great interest and enjoyment. The small amount of pocket-money they receive does not allow them either to contribute anything for such entertainments or go to the city for them. This small amount of \$600, disbursed under the direction of the governor, can be made the medium of much innocent pleasure to the old men, who have so little to break in upon the dull monotony of their lives. There is no fund at present from which such entertainments can be paid for, and I trust that the appropriation may be made.

For many years the gratuity given to the beneficiaries has remained the same, viz, \$1 per month. This is a small sum at any time, but now that the purchasing power of money has so greatly decreased it is of course proportionately less. It is recommended that this gratuity be increased to \$2 per month, and an estimate is accordingly made therefor.

During the past fiscal year the aggregate number of rations served at the asylum table was 2,000 less than the previous year; the cost was \$1,900 more. The explanation of this apparent paradox is to be found in the increased cost of provisions. The estimates for the coming fiscal year are based somewhat upon the rise in prices, and also to meet the contingency of any unusual increase in the number of inmates. Contracts are made at the beginning of the year for all articles of supplies, but these contracts are as to price only, the quantities varying with the number of inmates; any balance left from the appropriation at the end of the year reverts to the Treasury.

IN GENERAL.

The estimates for "general maintenance," "repairs and preservation," "civil list," and "contingent," are very nearly the same as those presented last year. Experience has proved that the sums appropriated for the fiscal year just closed, under the first two heads, were inadequate to meet the demands falling upon them, and Congress was called upon,

and responded by making an additional appropriation under the head of "maintenance," \$64,000, which barely carried the Bureau through the year, on a scale of expenditures which certainly was not advantageous to the interests of the Government, in that it did not admit of many things being done which properly pertain to this Bureau alone, and only admitted of tinkering where thorough repairs were necessary. Under the head of "maintenance" the reduced appropriations necessarily involve a large reduction of the watch-force, fire department, and consumption of gas, thereby exposing the valuable property within the navy-yards to greater danger by theft and fire. It is doubtful if the saving made by the reduced appropriations will, in the end, compensate for the losses that will occur from the above causes.

Under the head of "repairs and preservation," I have no hesitation in saying that the reduction of appropriations is not an economical measure. For the past two or three years this appropriation has not been sufficient to properly care for and keep in repair the property to which it properly pertains; consequently, deterioration is constantly progressing, until eventually rebuilding instead of repairing will be in order.

The so-called closing of certain navy-yards does not help the matter much, for while the yards are closed to work the valuable buildings and machinery are still there, requiring to be cared for and kept in repair, or else suffered to go to decay, so that when again occupied everything is sadly out of repair, requiring large expenditures to again put in working condition, or in case of selling the property will be in such bad condition as not to bring one-half its value.

The following estimates for the fiscal year ending June 30, 1885, are respectfully submitted:

NAVY-YARD, PORTSMOUTH, N. H.

For water-works.....	\$25,000 00
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NAVY-YARD, BOSTON, MASS.

For water-pipes.....	25,000 00
For cart-shed.....	10,000 00
For paving and grading.....	20,000 00
For floating gate for dry-dock.....	30,000 00
For rebuilding wharves.....	50,000 00
Total.....	135,000 00

NAVY-YARD, BROOKLYN, N. Y.

For building for yards and docks for general storage.....	85,000 00
For boiler-shop (wing to machine-shop).....	136,000 00
For shipwrights' shed.....	10,000 00
For paint-shop.....	20,000 00
For dredging.....	50,000 00
For caisson for dry-dock.....	30,000 00
Total.....	331,000 00

NAVY-YARD, LEAGUE ISLAND, PA.

For landing wharf, foot Fifteenth street (75 by 400 feet).....	26,000 00
For dredging and filling in.....	100,000 00
Total.....	126,000 00

NAVY-YARD, WASHINGTON, D. C.

For new ordnance machine-shop.....	\$95,000 00
For extension of yard wall	21,000 00
For dredging, continuation of	25,000 00
Total	141,000 00

NAVY-YARD, NORFOLK, VA.

For centrifugal cataract pumps, including engine-house, pump-well, culvert, and boiler	45,000 00
For extension of quay wall	200,000 00
For dry-dock extension	200,000 00
For railroad extension and engine-house	20,000 00
For coal-house No. 54	60,000 00
For marine railway	100,000 00
Total	625,000 00

NAVY-YARD, MARE ISLAND, CALIFORNIA.

For continuation of dry-dock	500,000 00
For extension of timber-shed	11,000 00
For cisterns	40,000 00
For wharves, bridges, landings, and boats	75,000 00
For roads, walks, gutters, and drains	20,000 00
For artesian well	10,000 00
Total	656,000 00

NAVAL STATION, NEW LONDON, CONN.

For quay wall	150,000 00
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NAVAL STATION, KEY WEST, FLA.

For bulkhead at water-front	4,500 00
For purchase of Mallory lot	15,000 00
Total	19,500 00

RECAPITULATION OF ESTIMATES.

Sheet No. 1. For support of Bureau of Yards and Docks	13,360 00
No. 2. For general maintenance and contingent	440,000 00
No. 3. For support of Naval Asylum	92,251 00
No. 4. For repairs and preservation	400,000 00
No. 5. For improvements at navy-yards	2,208,500 00
No. 6. For civil establishment	45,929 75
Total	3,200,040 75

Accompanying this report is an abstract of offers for supplies received for furnishing articles coming under the cognizance of the Bureau of Yards and Docks, made in conformity to act of Congress approved March 3, 1843.

I am, very respectfully, your obedient servant,

ED. T. NICHOLS,
Chief of Bureau.

Hon. WM. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

No. 1.—*Report of expenditures at navy-yards, stations, and Naval Asylum for the year ending June 30, 1883.*

Yards and stations.	Appropriations.					
	Yard improve- ments.	Repairs and preser- vation.	General main- tenance.	Civil establisb- ment.	Contingent.	Total.
Portsmouth, N. H		\$17,932 17	\$33,405 92	\$3,044 58	.....	\$54,382 67
Boston, Mass		27,993 34	48,686 64	2,700 00	\$100 75	79,480 73
New London, Conn	\$128 85	738 89	4,100 93	214 58	.....	5,183 25
New York, N. Y	99,213 23	24,403 68	67,149 76	3,566 11	6,516 62	200,849 40
League Island, Pa		12,846 15	34,163 05	2,417 06	866 67	50,292 93
Washington, D. C	17,529 45	13,010 62	35,000 32	2,533 50	743 12	68,817 01
Norfolk, Va	4,512 51	28,791 45	42,623 90	2,067 68	5,263 53	83,259 07
Pensacola, Fla	20,550 76	10,252 35	18,875 33	1,614 00	.....	51,292 44
Mare Island, California	218,547 71	32,716 49	47,216 85	2,378 50	2,703 00	303,562 55
Sackett's Harbor, N. Y			651 66	.....	51 20	702 86
Key West, Fla	26,986 83	1,527 00	1,755 75	.....	.....	30,269 58
Naval Asylum, Pa	58,751 69	.....	.....	.....	.....	58,751 69
Wharf at Erie, Pa .....		.....	.....	.....	500 00	500 00
Total	446,221 03	170,212 14	333,630 11	20,536 01	16,744 89	987,344 18

No. 2.—*Detailed report from navy-yards and stations of expenditures under "repairs and preservation" during the fiscal year ending June 30, 1883.*

Objects.	Ports- mouth.	Boston.	New London.	New York.	League Island.
Yard buildings	\$4,295 42	\$9,268 33	\$102 05	\$6,751 42	\$2,883 87
Officers' quarters	866 29	3,014 30	256 25	5,188 58	400 73
Wharves, bridges, landings, and boats	893 12	837 76	171 19	1,315 18	719 08
Roads, walks, gutters, and drains	1,066 98	1,318 22	94 50	2,065 10	6,840 59
Fences and walls	241 25	314 66	14 25	880 21	291 42
Cranes, scows, and derricks	226 99	346 30	.....	292 80	.....
Furnaces, forges, heating apparatus, &c.	2,002 06	1,252 72	33 55	828 78	444 56
Tracks and scales .....	.....	1,541 99	.....	8 40	22 42
Water and gas works	1,638 20	5,224 58	11 23	3,093 70	260 79
Dredging and scowing .....	.....	.....	.....	.....	.....
Dry-docks	331 60	244 52	.....	1,962 44	.....
Miscellaneous repairs	6,370 26	4,629 96	55 87	2,017 07	982 69
Total	17,932 17	27,993 34	738 89	24,403 68	12,846 15

Objects.	Washing- ton.	Norfolk.	Pensacola.	Mare Island.	Key West.	Total.
Yard buildings	\$5,452 99	\$4,515 75	\$1,148 90½	\$4,311 00	\$527 00	\$39,256 73½
Officers' quarters	639 67	5,528 70	1,199 17½	3,210 79	.....	20,304 48½
Wharves, bridges, landings, and boats	192 17	5,053 40	925 52	11,815 15	1,000 00	22,922 57
Roads, walks, gutters, and drains	2,469 60	4,508 01	721 91	7,005 85	.....	26,090 76
Fences and walls	317 35	1,276 52	181 57	1,762 97	.....	5,280 20
Cranes, scows and derricks	149 68	210 90	131 49	850 84	.....	2,209 00
Furnaces, forges, heating ap- paratus, &c	915 89	252 74	27 52½	170 00	.....	5,927 82½
Tracks and scales	124 02	1,539 62	.....	31 14	.....	3,267 59
Water and gas works	1,523 04	2,945 14	181 24	2,072 41	.....	16,950 33
Dredging and scowing	1,226 21	322 42	.....	1,273 00	.....	2,821 63
Dry docks .....	.....	132 43	1,065 16	184 34	.....	3,920 49
Miscellaneous repairs .....	.....	2,505 82	4,669 85½	29 00	.....	21,260 52½
Total	13,010 62	28,791 45	10,252 35	32,716 49	1,527 00	170,212 14

No. 3.—Detailed report of expenditures under “general maintenance” received from yard and stations during the fiscal year ending June 30, 1883.

Objects.	Ports-mouth.	Boston.	New London.	New York.	League Island.	Washington.
Freight and transportation.....		\$175 00		\$824 90	\$46 40	\$12 70
Printing, stationery, and advertising.....	\$410 49	417 33		888 95	461 22	536 89
Books, maps, models, and drawings.....						215 13
Purchase and repair of fire-engines.....	23 02		\$109 80	398 07	15 99	27 00
Machinery of every description and patent rights.....		75 35		54 35	213 99	227 97
Repairs on steam-engines and attendance on same.....				2,142 89	286 27	152 03
Purchase and maintenance of oxen and horses, pay of hired teams, &c.....	4,294 41	2,500 17	706 62	9,697 88	8,496 50	4,711 73
Carts, timber-wheels, and tools of every description.....	727 22	271 36	1 44	2,792 99	1,578 37	1,288 48
Postage on letters on public service and telegrams.....	124 82	20 00	6 00	17 37	176 71	322 80
Furniture for Government houses and offices in navy-yards.....	218 83	211 81		375 29	300 18	497 50
Coal and other fuel for yards and docks purposes.....	5,138 16	5,650 52	47 75	4,200 56	1,287 40	2,503 78
Candles, oil, and gas.....	1,643 38	3,019 94	30 00	2,997 45	166 48	938 49
Cleaning and clearing up yards and care of buildings.....	1,571 79	9,479 11		9,668 92	2,406 39	8,174 25
Attendance on fires, lights, fire-engines, and apparatus.....	2,872 16	2,619 08		5,224 38	4,619 37	2,545 13
Incidental labor, not chargeable to other appropriations.....	6,260 01	7,170 88	777 32	7,474 19	8,476 66	3,820 33
Water tax.....	100 00	3,935 34	626 00	5,817 58		
Tolls and ferriage.....			14 00	195 75		
Pay of watchmen.....	9,870 60	13,057 24	1,782 00	13,993 00	5,497 00	8,999 62
Flags, awnings, and packing-boxes.....	76 03	83 51		385 24	134 12	26 49
Rent of landings.....	75 00					
Total.....	33,405 92	48,686 64	4,100 93	67,149 76	34,163 05	35,000 32

Objects.	Norfolk.	Pensacola.	Mare Island.	Key West.	Sackett's Harbor.	Total.
Freight and transportation.....			\$3,716 58			\$4,775 58
Printing, stationery, and advertising.....	\$323 64	\$179 63	665 51	\$18 00		3,901 66
Books, maps, models, and drawings.....	106 75		1,007 80			1,329 68
Purchase and repair of fire-engines.....	28 59	938 42	581 00			2,121 89
Machinery of every description and patent rights.....	705 71	35 33	1,013 73			2,326 43
Repairs on steam-engines and attendance on same.....	444 05	1,049 84	1,980 14			6,055 22
Purchase and maintenance of oxen and horses, pay of hired teams, &c.....	8,417 62	2,966 88	6,770 90			48,562 71
Carts, timber-wheels and tools of every description.....	2,702 00	116 86	1,566 66			11,045 38
Postage on letters on public service and telegrams.....		245 19	1,398 69			2,311 58
Furniture for Government houses and offices in navy-yards.....	704 31	9 07	356 71			2,673 70
Coal and other fuel for yards and docks purposes.....	251 70	163 63	36 47			19,279 97
Candles, oil, and gas.....	2,810 04	404 70	4,740 30	15 00		16,765 78
Cleaning and clearing up yards and care of buildings.....	6,200 61	4,584 81	5,843 70			47,929 58
Attendance on fires, lights, fire-engines, and apparatus.....	3,539 50	474 49	3,070 66			24,964 77
Incidental labor, not chargeable to other appropriations.....	4,078 73		3,960 99	388 50	\$651 66	43,059 27
Water tax.....	39 69	168 00	5,307 51	73 00		16,067 12
Tolls and ferriage.....	237 50		2,480 00			2,927 25
Pay of watchmen.....	11,955 72	7,538 48	2,613 80	1,261 25		76,568 71
Flags, awnings, and packing-boxes.....	77 74		105 70			888 83
Rent of landings.....						75 00
Total.....	42,623 90	18,875 33	47,216 85	1,755 75	651 66	333,630 11

No. 4.—*Estimates received from navy-yards, stations, and Naval Asylum for fiscal year ending June 30, 1885.*

Yards and stations.	Appropriations.				
	Yard im- provements.	Repairs and preservation.	General maintenance.	Civil estab- lishment.	Total.
Portsmouth, N. H.....	\$25,000 00	\$57,500 00	\$55,127 00	\$4,600 00	\$142,227 00
Boston, Mass.....	2,862,078 62	370,500 00	74,800 00	7,256 25	3,314,634 87
New London, Conn.....		1,200 00	5,650 00		6,850 00
New York, N. Y.....	535,000 00	170,000 00	98,400 00	8,200 00	811,600 00
League Island, Pa.....	936,366 42	134,000 00	80,000 00	9,700 00	1,160,066 42
Washington, D. C.....	171,711 00	45,000 00	54,010 00	3,717 25	274,438 25
Norfolk, Va.....	1,065,403 01	157,102 87	92,697 04	6,656 25	1,321,859 17
Pensacola, Fla.....		9,704 20	30,349 28	2,500 00	42,553 48
Mare Island, California.....	784,666 93	170,000 00	72,000 00	6,900 00	1,033,566 93
Sackett's Harbor, N. Y.....		1,000 00			1,000 00
Key West, Fla.....	15,000 00	8,303 70	1,789 25		25,092 95
Naval Asylum, Pennsylvania.....	92,251 00				92,251 00
Total.....	6,487,476 98	1,124,310 77	564,822 57	49,529 75	8,226,140 07

No. 5.—*Detailed estimates from yards and stations for works of improvement for the fiscal year ending June 30, 1885.*

Yards, stations, and objects.	Estimates.	Total.
PORTSMOUTH, N. H.		
For water works.....	\$25,000 00	\$25,000 00
BOSTON, MASS.		
For iron-platers' shop.....	120,713 89	2,862,078 62
For water-pipes.....	49,607 00	
For cart-shed.....	10,408 45	
For erecting and copper shop.....	42,353 85	
For paving and grading.....	43,109 40	
For floating-gate dry-dock.....	31,883 75	
For officers' quarters, L, M, N, and O (improvements of).....	28,610 00	
For rebuilding wharves.....	74,244 78	
For additional dry-dock.....	2,455,200 00	
For new chapel.....	5,947 50	
BROOKLYN, N. Y.		
For building for yards and docks for general storage.....	85,000 00	535,000 00
For boiler shop (wing to machine shop).....	136,000 00	
For shipwright's shed.....	14,000 00	
For paint shop.....	20,000 00	
For dredging.....	100,000 00	
For repairs to saluting battery, cob-dock.....	150,000 00	
For new dry-dock caisson.....	30,000 00	
LEAGUE ISLAND, PENNSYLVANIA.		
For store-house for ordnance.....	182,414 47	936,366 42
For store-house for provisions and clothing.....	209,237 84	
For store-house for equipment and recruiting.....	209,237 84	
For office building for yard paymaster.....	19,579 29	
For office building for medicine and surgery.....	19,579 29	
For office building for commandant.....	53,735 59	
For dwellings B and C.....	30,582 85	
For dwellings D and E.....	30,582 85	
For landing wharf foot of Fifteenth street (75×400).....	26,416 40	
Dredging and filling in.....	155,000 00	
WASHINGTON, D. C.		
For new ordnance machine shop.....	95,000 00	171,711 00
For extension of yard wall.....	21,711 00	
For dredging, continuation of.....	25,000 00	
For purchase of steam tug.....	5,000 00	
For purchase of squares 853 and 826 for extension of yard.....	25,000 00	
NORFOLK, VA.		
For boiler shop No. 41.....	52,673 25	45,946 49
For extension of erecting shop No. 23.....	13,998 45	
For two centrifugal cataract pumps, including engine-house, pump-well, culverts, and boiler.....	45,822 80	
For extension of quay-wall.....	363,425 00	
For dry-dock extension.....	202,247 34	
For railroad extension and engine-house.....	45,946 49	

No. 5.—Detailed estimates from yards and stations for works of improvement, &c.—Continued.

Yards, stations, and objects.	Estimates.	Total.
NORFOLK, VA.—Continued.		
For one large floating derrick	\$49,189 71	
For plant for electric light, &c., complete	18,000 00	
For chain and cordage store No. 63	37,483 94	
For store-houses Nos. 34 and 35	71,034 42	
For coal-house No. 54	64,000 41	
For marine railway	101,581 20	
		\$1,065,403 01
MARE ISLAND, CALIFORNIA.		
For dry-dock continuation	500,000 00	
For timber-shed, extension of	11,803 13	
For cisterns	46,346 30	
For wharves, bridges, landings, and boats	130,000 00	
For roads, walks, gutters, and drains	46,517 50	
For artesian well	10,000 00	
For rolling-mill	40,000 00	
		784,666 93
KEY WEST, FLA.		
For purchase of Mallory lot	15,000 00	
		15,000 00
NAVAL ASYLUM, PHILADELPHIA, PA.		
For support of beneficiaries, improvements, and all expenses	92,251 00	
		92,251 00
Total		6,487,476 98

No. 6.—Detailed estimates from navy-yards and stations for “repairs and preservation” for the fiscal year ending June 30, 1885.

Objects.	Portsmouth.	Boston.	New London.	New York.	League Island.	Washington.
Yard buildings	\$20,000 00	\$150,000 00	\$300 00	\$40,000 00	\$29,481 30	\$20,000 00
Officers' quarters	4,000 00	3,000 00	300 00	5,000 00	998 20	1,500 00
Wharves, bridges, landings, and boats	5,000 00	15,000 00	200 00	30,000 00	21,603 75	1,500 00
Roads, walks, gutters, and drains	3,000 00	22,500 00	100 00	5,000 00	1,072 50	2,500 00
Fences and walls	1,000 00	5,000 00	150 00	5,000 00	252 30	250 00
Cranes, scows, and derricks	2,000 00	115,000 00		10,000 00	1,655 50	500 00
Furnaces, forges, heating apparatus, &c	2,500 00	5,000 00	50 00	2,500 00	1,272 00	12,750 00
Tracks and scales	500 00	10,000 00		2,500 00	5,625 00	4,000 00
Water and gas works	4,500 00	15,000 00		5,000 00	2,651 00	2,000 00
Dredging and scowing		5,000 00		10,000 00	12,153 00	
Dry-docks	10,000 00	15,000 00		50,000 00		
Miscellaneous repairs	5,000 00	10,000 00	100 00	5,000 00	27,235 45	
Dikes					30,000 00	
Total	57,500 00	370,500 00	1,200 00	170,000 00	134,000 00	45,000 00

Objects.	Norfolk.	Pensacola.	Mare Island.	Sackett's Harbor.	Key West.	Total.
Yard buildings	\$51,542 66	\$2,062 18	\$15,000 00		\$942 70	\$329,328 84
Officers' quarters	2,349 01	3,016 17	4,000 00			24,163 38
Wharves, bridges, landings and boats	46,918 47		20,000 00		4,490 00	144,712 22
Roads, walks, gutters, and drains	23,053 59	534 18	20,000 00			77,760 27
Fences and walls	5,288 65	806 60	5,000 00			22,747 55
Cranes, scows, and derricks	5,496 42	245 00	25,000 00			159,896 92
Furnaces, forges, heating apparatus, &c	391 15		2,000 00			26,463 15
Tracks and scales	2,886 58		2,000 00		837 00	28,348 58
Water and gas works	7,243 03		10,000 00		1,034 00	47,428 03
Dredging and scowing	6,346 29					33,499 29
Dry-docks	3,542 80	921 00	60,000 00			139,463 80
Miscellaneous repairs	2,044 22	2,119 07	7,000 00	\$1,000 00	1,000 00	60,498 74
Dikes						30,000 00
Total	157,102 87	9,704 20	170,000 00	1,000 00	8,303 70	1,124,310 77

No. 7.—Detailed estimate for “general maintenance” received from yards and stations for the fiscal year ending June 30, 1885.

Objects.	Ports- mouth.	Boston.	New London.	New York.	League Island.
Freight and transportation.....	\$100 00	\$200 00	\$25 00	\$1,000 00	\$100 00
Printing, stationery, and advertising ...	600 00	500 00	100 00	1,500 00	1,000 00
Books, maps, models, and drawings	200 00	100 00	50 00	1,000 00	1,000 00
Purchase and repair of fire-engines	2,000 00	1,000 00	.....	5,000 00	3,842 10
Machinery of every description and pat- ent rights .....	.....	500 00	.....	5,000 00	4,825 00
Repairs on steam-engines and attend- ance on same	500 00	2,500 00	.....	2,500 00	1,197 20
Purchase and maintenance of oxen and horses, pay of hired teams, &c.....	6,000 00	15,000 00	725 00	12,500 00	12,555 00
Carts, timber-wheels, and tools of every description	2,500 00	8,500 00	200 00	5,000 00	13,882 38
Postage on letters on public service and telegrams	150 00	100 00	20 00	200 00	1,000 00
Furniture for Government houses and offices in navy-yards	2,500 00	1,500 00	.....	2,500 00	2,770 00
Coal and other fuel for yards and docks purposes	5,000 00	4,000 00	100 00	4,000 00	5,950 00
Candles, oil, and gas	3,000 00	3,000 00	40 00	3,500 00	660 00
Cleaning and clearing up yards and care of buildings	6,000 00	15,000 00	.....	12,000 00	6,500 00
Attendance on fires, lights, fire-engines, and apparatus	5,000 00	3,700 00	.....	6,000 00	8,500 00
Incidental labor, not chargeable to other appropriations	10,000 00	2,000 00	2,000 00	10,000 00	8,113 12
Water tax	100 00	5,000 00	.....	6,000 00	.....
Tolls and ferriage	50 00	.....	40 00	200 00	.....
Pay of watchmen	11,227 00	12,000 00	2,300 00	20,000 00	7,300 00
Flags, awnings, and packing-boxes.....	200 00	200 00	50 00	500 00	805 20
Rent of landings .....	.....	.....	.....	.....	.....
Total.....	55,127 00	74,800 00	5,650 00	98,400 00	80,000 00

No. 7.—Detailed estimate for “general maintenance,” &c.—Continued.

Objects.	Wash- ington.	Norfolk.	Pensa- cola.	Mare Island.	Key West.	Total.
Freight and transportation	\$40 00	\$100 00	\$50 00	\$5,000 00	\$200 00	\$6,815 00
Printing, stationery, and advertising....	800 00	450 00	250 00	1,000 00	60 00	6,260 00
Books, maps, models, and drawings	20 00	1,001 00	100 00	1,000 00	.....	4,471 00
Purchase and repair of fire-engines	8,000 00	2,824 75	.....	6,000 00	.....	28,666 85
Machinery of every description and pat- ent rights	1,000 00	4,078 25	.....	2,000 00	.....	17,403 25
Repairs on steam-engines and attendance on same	500 00	18,470 20	3,146 75	2,500 00	.....	31,314 15
Purchase and maintenance of oxen and horses, pay of hired teams, &c.....	5,000 00	13,733 02	4,509 89	7,000 00	.....	77,022 91
Carts, timber-wheels, and tools of every description	2,500 00	13,174 88	2,113 30	3,000 00	.....	50,870 56
Postage on letters on public service and telegrams	50 00	25 00	348 75	1,500 00	.....	3,393 75
Furniture for Government houses and offices in navy-yards	3,000 00	9,127 11	550 00	6,000 00	.....	27,947 11
Coal and other fuel for yards and docks purposes	2,000 00	2,053 00	.....	4,000 00	.....	27,103 00
Candles, oil, and gas	1,500 00	2,667 00	624 00	5,000 00	70 00	20,061 00
Cleaning and clearing up yards and care of buildings	10,000 00	7,164 28	10,160 41	6,000 00	.....	72,824 69
Attendance on fires, lights, fire-engines and apparatus	2,500 00	3,676 85	534 18	5,000 00	.....	34,911 03
Incidental labor, not chargeable to other appropriations.....	5,000 00	1,928 60	.....	7,500 00	.....	46,541 72
Water tax .....	.....	45 00	168 00	4,500 00	73 00	15,886 00
Tools and ferriage .....	.....	250 00	.....	2,000 00	.....	2,540 00
Pay of watchmen.....	12,000 00	11,346 00	7,578 00	2,500 00	1,336 25	87,587 25
Flags, awnings, and packing boxes	100 00	582 10	216 00	500 00	50 00	3,203 30
Rent of landings.....	.....	.....	.....	.....	.....	.....
Total.....	54,010 00	92,697 04	30,349 28	72,000 00	1,789 25	564,822 57

ABSTRACT OF OFFERS FOR FURNISHING SUPPLIES FOR THE SEVERAL NAVY-YARDS UNDER THE COGNIZANCE OF THE BUREAU OF YARDS AND DOCKS.

Schedule of offers for supplies for navy-yard at Boston, Mass., under advertisement dated September 11, 1882.

COAL.

C. A. Campbell	*\$3,473 75
H. Snelling & Co.	3,492 75
D. Babcock & Co	3,685 00

Schedule of offers for supplies for navy-yard at Brooklyn, N. Y., under advertisement August 21, 1882.

COAL.

Samuel G. French	*\$2,480 00
David Babcock & Co	2,618 75
C. H. Bass	2,541 75
C. H. Raymond	2,584 25

Schedule of offers for supplies for navy-yard at Brooklyn, N. Y., under advertisement dated December 12, 1882.

YELLOW-PINE TIMBER.

Wm. White & Son	\$14,820 00
A. A. McCullough	18,126 00
D. Babcock & Co	14,440 00
Geo. McQuesten & Co	*13,300 00

Schedule of offers for construction of sewer at navy-yard at Brooklyn, N. Y., under advertisement September 20, 1882.

CONSTRUCTION OF SEWER.

Names.	Time to commence.	Time to complete.	Amount of bid.
John Brady	5 days	90 days	\$68,610 00
J. F. Gillon	10 days	145 days	87,905 00
David Babcock & Co	At once	120 days	100,690 00
Freel and McNamee	10 days	100 days	88,125 00
S. L. Keeney	5 days	365 days	110,871 00
John McKim & Son	At once	165 days	126,100 00
Langan Worth & Co	6 days	100 days	80,725 00
Charles Hart	1 day	100 days	95,300 00
Edward Doeling & Co	1 day	110 days	85,425 00
Michael Marray	2 days	110 days	76,925 00

Bids unsatisfactory, and no award made.

Schedule of offers for construction of sewer at navy-yard at Brooklyn, N. Y., under advertisement October 20, 1882.

CONSTRUCTION OF SEWER.

No.	Names of bidders.	Time to commence.	Time to complete.	Amount of bid.
1	Freel & McNamee	5 days	100 days	\$88,125 00
2	David Babcock & Co	Immediately ..	120 days	99,040 00
3	Michael Tobin	do	100 days	65,650 00
4	John Kelly	10 days	10 months	103,175 00
5	Charles Hart	Immediately ..	110 days	*97,800 00
6	James H. Sullivan	10 days	300 days	106,000 00
7	John Brady	Immediately ..	100 days	79,500 00
8	John McKim	5 days	165 days	96,000 00
9	Austin P. Brown	10 days	150 days	96,200 00

No. 1. Declined to enter into contract. No. 3. Fictitious bid. No. 7. Failed to bond as required. No. 8. Time too long to complete work. 9. Bid received too late. No. 5 (*). Awarded to.

*Awarded.

Schedule of offers for supplies for navy-yard at Washington, D. C., under advertisement August 18, 1882.

YELLOW PINE AND H. FRMS.

W. W. McCullough	*\$1,396 72
Wheatley Bros.....	1,525 93
T. W. Smith	1,529 20
G. A. Shehan	1,582 07

FEED.

Metzger & Bro.....	1,808 64
R. C. Hewett	*1,772 04
J. D. Cumming	1,881 24

SPERM OIL

Metzger & Bro.....	321 75
Z. D. Gilman	*310 50
Johnson Bros	315 00

CUMBERLAND COAL.

T. B. Cross, jr	2,205 50
Stephenson & Bro	2,310 00
Johnson Bros	*2,183 50

CUMBERLAND COAL.

T. B. Cross, jr	2,406 00
Stephenson & Bro	2,520 00
Johnson Bros	*2,382 00

Schedule of offers for lumber for navy-yard at Washington, D. C., invited May 17, 1883, on requisition 58.

LUMBER.

Wheatley Bros	\$1,152 70
Do	940 70
W. W. McCullough	*665 00

Schedule of offers for supplies for the navy-yard at Norfolk, Va., under advertisement August 10, 1882.

PROVENDER.

Evans & Burwell	\$1,060 40
A. H. Lindsay	†1,004 59
A. A. McCullough.....	1,131 20
Butt & Neville.....	1,059 89

Scale of offers for supplies for navy-yard at Pensacola, Fla., requisition 13, October 28, 1882.

8,000 FEET YELLOW PINE LUMBER.

J. O. Neal, \$20 per M	*\$160 00
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Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement of August 17, 1882.

GRANITE.

	Per cubic foot.	
James McCudden.....	\$2.05	*\$77,600 70
William Center.....	2.08	78,736 32
A. Powell	2.15	81,386 10
G. Griffith.....	2.22	84,035 88
John N. Taylor.....	2.60	98,420 40
E. Hawes.....	2.39	89,461 06
Jackson J. Wentworth	2.45	92,742 30

*Awarded.

†Accepted.

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement August 18, 1882.

STATIONERY.

H. S. Crocker & Co.....	*\$523 76
Dutton & Patridge.....	597 45

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement August 21, 1882.

MARBLE DUST.

James McCudden	\$10 50
A. Powell.....	*10 00

COAL.

James McCudden.....	*1,822 50
A. Powell.....	1,850 00

LUMBER.

James McCudden	969 00
A. Powell.....	*940 00

ROPE YARN SIZING.

G. M. Josselyn.....	756 00
Coffin & Hendry.....	811 10
James E. Gordon.....	*742 00

IRON AND STEEL FORMS.

G. W. Gibbs & Co	†370 45
James E. Gordon.....	417 60
J. S. Van Winkle & Co.....	*415 28

BUSHINGS.

Coffin & Hendry	*103 20
James E. Gordon.....	216 00

Schedule of offers for supplies for navy-yard at Mare Island, California, under advertisement September 6, 1882.

PROVENDER.

James Brownlie.....	*\$1,493 50
James McCudden.....	1,494 42
A. Powell.....	1,546 00

Schedule of offers for supplies for navy-yard at Mare Island, California, under advertisement September 1, 1882.

3,000 CUBIC YARDS STONE.

	Per cubic yard.
John Hughes	*\$2 15
L. Ferkelson.....	2 25
M. O'Donnell and John McManus.....	2 25
T. McCarty	3 27
A. Powell.....	3 50
M. J. Kelly	2 99

Schedule of offers for supplies for navy-yard at Mare Island, California, under advertisement September 11, 1882.

TIMBER.

A. Powell.....	*\$1,078 80
James McCudden.....	1,097 40
Renton, Holmes & Co.....	1,116 00
John Hughes	†858 60

*Awarded.

† Incomplete.

‡ Irregular.

COAL.

A. Powell.....	\$2,200 00
James McCudden	*2,190 00
John Hughes	†1,980 00

GRAVEL.

A. Powell.....	23,100 00
James McCudden	22,500 00
Warren B. English.....	*18,500 00
John Hughes	†20,500 00

SAND.

A. Powell.....	635 00
James McCudden	650 00
Aden Bros	*625 00
John Hughes.....	†1,000 00

CEMENT.

A. Powell.....	5,050 00
James McCudden	*5,030 00

HARDWARE.

Gordon Hardware Company	*37 50
George T. Howley.....	40 40

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement, October 21, 1882.

MANILA ROPE.

James E. Gordon.....	†\$728 43
Coffin & Hendry	750 97
G. M. Josselyn & Co	750 96

Schedule of offers for supplies for the navy yard at Mare Island, California, under advertisement, October 10, 1882.

6,000 TONS UNBROKEN STONE.

	Per ton.	
James McCudden.....	*\$1 54	\$9,240
L. Terkleson & Bro	1 55	9,300
A. Powell.....	1 95	11,700

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement December 7, 1882.

70 TONS HAY.

James McCudden.....	*\$1,330 00
E. J. Wilson	1,400 00
A. Powell.....	1,470 00
James Brownlee.....	1,470 00

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement February 1, 1883.

3,000 CUBIC YARDS SAND.

	Per cubic yard.	
Aden Bros	\$2 50	\$7,500
A. Powell	2 75	8,250

Not awarded—price too high.

*Awarded.

†Irregular.

‡Accepted.

Schedule of offers for supplies for the navy-yard at Mare Island, California, under advertisement May 5, 1883.

100 TONS WELLINGTON COAL.

James McCudden	* \$945 00
L. Summerfield	1,050 00

Proposals for rock for filling in at bulkhead at Key West, Fla., invited April 25, 1883.

3,000 CUBIC YARDS ROCK.

Primus Days	per cubic yard....	*\$0 58
A. A. Brooks	do	95
Harris & Walker, 700 loads	per load	60

UNITED STATES NAVY-YARD,
Washington, D. C., February 2, 1883.

SIR: In compliance with instructions contained in your order of the 17th ultimo, a copy of which is hereunto appended, marked A, and of the order of January 27 to Civil Engineers White and McCollom, marked B and C, we have carefully considered the plan submitted by Civil Engineer A. G. Menocal, U. S. N., for the enlargement and maintenance of the channel leading to the navy-yard, Washington, and have the honor to submit the following report.

The Board does not consider it necessary to enter into any argument to show the necessity of the adoption of some plan to improve and maintain the channel in order to insure the efficiency of the navy yard. It is believed that this necessity is patent to all. In addition to the testimony of officers who, in years past have navigated this channel, which bears simply upon the general changes which have taken place in the regimen thereof, attention is called to sheet No. 11 of drawings attached to and forming a part of this report. This sheet shows the comparative cross-sections of the channel taken at five different points in 1828, 1842, and 1882. An examination of these different cross-sections will show the rapidity of the silting up of the channel, and, judging from the great changes which have taken place in the last forty years, the time is not far distant when the channel, as such, will become totally obliterated. In addition to the deposits shown to have taken place in the last forty years, much material was removed by dredging between the years 1850 and 1869, during which period the dredge was used extensively, the amount so moved being probably fully equal to one-half what is now found in the channel, as compared with the channel as it existed in 1842.

The enlargement of this channel by dredging would be a most expensive operation, and in order to maintain it after completion would require large annual outlay. The plans, as submitted by Mr. Menocal, will cause the forces of nature, which now operate to the detriment of the channel, to change their action and tend to the enlargement and improvement thereof. From the nature of the material composing the bottom of the river, no reasonable doubt obtains as to the immediate result which will follow the construction of this work of improvement.

When the works are first introduced the velocity of the current during the ebb of the tide through the dikes will be on the surface about 4.54 feet per second, giving a bottom velocity of 2.72 feet per second, a

velocity sufficient to scour large gravel and small stones. The action of the water moving between the dikes at so great a velocity will, in a bottom like the one under consideration, be very rapid, and but a short time will elapse before a channel of the calculated dimensions will be obtained. As regards the maintenance of this channel by the proposed works of improvement, the Board would say that this depends entirely upon the maintenance of the "basin" above the dam. It is a well established principle of hydraulic engineering that after the regimen of a channel has become stable, it will remain so as long as the velocity of the current remains the same; any disturbing cause that effects this velocity will have a corresponding effect upon the regimen of the stream.

The erection of the proposed works of improvement will cause a more rapid silting up of the bottom of the basin than is at present taking place, and when this silting up has so far progressed as to diminish the prism of scour, a corresponding decrease in the velocity of the ebb current will follow with a corresponding silting up of the bottom of the channel. An examination of the comparative cross-sections across that part of the flats included in the basin, shows the amount of deposit made in the last forty years, and shows, also, that it has been much more rapid in those portions near the channel.

Until the silting up in the basin has reached the plane of mean low water, no decrease of the prism of scour will ensue; above that plane the prism will be affected, causing a corresponding decrease in the velocity of the water through the channel with corresponding injurious results. The silting up in the basin will be more rapid in the proximity of the dikes, and there will be found in a few years that this silting up will have reached such a stage as to require attention. The length of the time that will elapse before this silting up of the bottom of the basin will have attained such a stage as to materially diminish the prism of scour, is simply a matter of conjecture: no definite period can be assigned for this. At intervals, when it is found that the prism of scour has become diminished to an injurious extent the basin will have to be deepened by dredging or some other means.

As regards the gates in the dam the Board would say that they are experimental. They seem to possess much merit. The method of operation is new and the estimated cost is small. The mechanism for the automatic operation is worthy of a trial, and should it not prove satisfactory can be easily and economically modified so as to become effective.

The part most liable to prove unsatisfactory is that contained in the first tank, devised to operate the valve leading into the second tank, wherein is located the float designed to operate the gates. For the details of construction of the gates and their mode of operation the Board refers to the appended paper and drawings. This work of improvement being permanent in its nature, the Board is of the opinion that the piling and sheet piling in both dam and dikes are too light, and would recommend that this part of the work be made heavier than shown in the plans.

As regards the estimated cost of the proposed work the Board would say that having carefully considered the estimates prepared by Mr. Menocal, it has added thereto \$30,000 to meet the expense of the modifications heretofore recommended in the dam and dikes, making a total estimated cost of \$91,373.

In the estimates, as prepared by Mr. Menocal, \$40,000 additional are allowed for dredging in the channel. This amount is considered ample.

After a full consideration of the plans and estimates as submitted by

Civil Engineer A. G. Menocal, U. S. N., the Board recommend the erection of the works as modified in this report.

Very respectfully, your obedient servants,

A. A. SEMMES,
Commodore and President of Board.
RICHARD W. MEADS,
Captain and Member.
H. L. HOWISON,
Commander and Member.
M. T. ENDICOTT,
Civil Engineer and Member.
U. S. G. WHITE,
Civil Engineer and Member.
W. H. JAQUES,
Lieutenant and Member.
THOMAS C. MCCOLLUM,
Civil Engineer and Member.

Hon. W. E. CHANDLER,
Secretary of the Navy.

COMMANDANT'S OFFICE,
Navy-Yard, Washington, D. C.

Forwarded February 3, 1883.

JAMES A. GREER,
Captain, Commanding.

[Reprinted from No. 22 of the Proceedings U. S. Naval Institute.]

CHANNEL IMPROVEMENT, WASHINGTON NAVY-YARD.

By Civil Engineer A. G. MENOCAL, U. S. N.

NAVAL INSTITUTE, WASHINGTON BRANCH, DECEMBER 21, 1882.

Rear-Admiral Thornton A. Jenkins, U. S. N., in the chair.

In complying with a request to prepare a paper for the Naval Institute, I have presumed that I may be permitted to take up and discuss a subject not directly relating to naval matters, but yet one that may profitably occupy the attention of this Institute. I shall have attained the object sought if this presentation leads to the further discussion of a subject which, falling directly within the profession of the civil engineer, at the same time concerns the naval service through its bearings over the question of maintenance and enlargement of the Washington navy-yard, one of our most valuable naval stations, the efficiency of which would be greatly promoted by a happy solution of the problem suggested by the title of this paper. Therefore, it is not proposed to dwell upon the value of the yard as a base of operations for offense and defense—that can better be done by other members of the Institute, students of military science—but as the conditions combine to make it an important manufacturing station, so also may they, if properly utilized, contribute to convert it into an equally valuable building establishment. These conditions are too well known to require from me special reference; I may, however, call attention to the fact that however valuable in the abstract, they are all subservient to the important factor, the accessibility of the yard to sea-going vessels.

This channel does not, in its present condition, satisfy the requirements of the station, and so the yard cannot satisfy the requirements of the service. The accompanying chart, prepared from data obtained by recent carefully conducted surveys, shows that the channel through which once floated the Minnesota, and even ships of 24 feet draught, in front of the yard and for some distance below, now has a mean maximum depth of 20 feet and minimum depth of 13 feet. Whatever be the causes that have produced these results, it is indisputable that they are still active, and unless some effective means are provided for arresting these causes, and for enlarging and preserving this channel, the few of our vessels of war which can still reach the yard will be shut out, and no craft larger than a yawl or a flatboat will enter the Eastern Branch.

The numerous shops and valuable plant accumulated at immense cost, and so efficiently employed in the past in producing the best materials for the use of the Navy, and which might and ought to be employed in building the new navy, will become useless and well nigh valueless. At the present time, only by the removal of no less than a million cubic yards of silt, could channel dimensions commensurate with the immediate needs and purposes of the station be obtained. That, however, would afford but temporary relief, for unless some other means are devised for maintenance this navigable track can only be kept open by continuous dredging at an annual expenditure of a large sum. The difficulty of obtaining a yearly appropriation for that purpose is apparent to all, and attested by the present condition of the channel. It is necessary, therefore, to look to other means for securing the same results at less expense.

It is not my purpose to present in the following discussion any novel theories of hydraulic engineering, or to enlarge on those already known to the profession; my object is rather to determine certain physical conditions, to measure and weigh the active forces, and then to ascertain if their action cannot be modified by the application of some well-defined fundamental laws, and certain desired effects produced.

The Eastern Branch partakes more of the nature of a long inlet or estuary than of a river. Owing to a limited water-shed, of about 115 square miles, the stream above the tidal compartment has an ordinary flow of only 106 cubic feet per second, and may be denominated a small creek. In the lower portions its volume fluctuates with and is mainly due to the action of the tides. There appears to be a tradition to the effect that in former years a uniformly deep channel extended from the Potomac to Bladensburg, the latter point having been accessible to large schooners. The writer has not been able to obtain any map confirming that statement, but its accuracy is admitted.

The present condition of the channel may be explained when we consider the accumulated work of the tides and their tendency to silt up the river to the extent of their influence, as I shall endeavor to show further on, and the disintegration and wash by the rain of the adjoining lands which include the whole water-shed of the Potomac River above Washington, formerly covered with forests or thick vegetation, but now nearly bare the greater portion of the year and constantly turned up for agricultural purposes. A comparison of the chart herewith submitted (Fig. 1) with a map of the river from the Potomac to Bladensburg, completed by the United States Coast Survey in 1861, shows a marked reduction in the depth of both the channel and the area of the marshes or flats, and a reference to local surveys, conducted from time to time in the vicinity of the yard, indicates that the silting of the river progresses as the depth decreases. The object of the following discussion is to show

that this deposition of sediment is largely due to the action of the tides, and that unless the existing physical conditions are modified with a view to turn to advantage what is now a serious evil, the river will be hopelessly lost for the purposes of navigation (except, as before stated, through a judicious and expensive system of dredging), and as a consequence, the tidal portion of the stream will be converted at no distant day into a pestilential swamp, a receiving basin of nauseous sewer deposits, and a nuisance of equal proportions and not inferior in its malarial developments to the one west of the city now in process of eradication at an enormous expenditure of public money. It is proposed to point out the method by which those tendencies may be diverted from their present work of destruction, and the forces now acting to destroy, turned to advantage and usefulness.

Tide-gauge observations at the navy-yard for a period of over nine months show the mean range of the tide to be 3.1 feet, and the mean duration of the flood tide five hours and thirty-five minutes, while that of the ebb-flow is six hours and forty-nine minutes. It is evident that the water moving out through a given sectional area at each ebb tide is equal in amount to that flowing in with the preceding flood, plus the discharge of the river above the tidal compartment during the ebb and flood. In the present case the latter amount is but 0.006 of the former, consequently the mean velocity of the flood current opposite the navy-yard must be greater than that of the ebb in the proportion of the duration of the tidal flow, or as 121 is to 100; and as the scouring power of the current increases as the square of the velocity, the amount of sediment transported up stream by the flood must be greater than that carried down by the ebb, a fact which may be accepted as a marked indication that there is a constant deposition of material tending to silt up the stream. Figure 3 is an illustration of and seems to verify the foregoing conclusions. It represents the tidal and current curves of a mean tide, constructed from careful and simultaneous observations at both the navy-yard and arsenal wharf. The time of highest and lowest level of water and the precise moment of the turning of the tides were carefully noted, and the current observations were taken with great precision at intervals of ten minutes during the flood and ebb of the same tide. Similar observations were made for a period of seventy-two hours at the two above-named stations, at the Baltimore and Potomac Railroad Bridge, and at Benning's Bridge across the branch; but the results for current velocities at the last two stations were somewhat disconnected and unsatisfactory, for while they seem to possess the same salient features of those taken with greater care at the yard and arsenal stations, the plotted curves do not present the desired regularity in outlines, and they are not presented. The full lines in the figures represent the tide curves, and the broken lines the current velocity for the flood and ebb of the same tide. The rise and fall at the yard is 3.45 feet, or 0.35 foot in excess of the range determined by more prolonged observations. It took the flood tide five hours and five minutes to reach that height, while the ebb consumed six hours and forty minutes in descending to a level but $\frac{1}{10}$ of a foot lower. The proportional duration of the flow of both the flood and ebb tides, as obtained from these observations, does not verify the deductions made from the gauge readings. This is explained by the fact that the water continued to move in and out of the estuary for some time after reaching its highest and lowest level, as will be shown hereafter. We shall have occasion to show, however, that the conclusions previously arrived at, as before stated, are verified by the last observations, and by a different process. The flood

current at the navy-yard, as will be seen from the curve represented in Fig. 3, attained a maximum velocity of 2.25 feet per second during the second quarter of the flow, while the ebb current in the same tide did not reach its maximum speed of 2.01 feet per second until the end of the third quarter. The rapid increase in the velocity of the flood current during the first stage of the tide, and the decided retardation of the speed immediately following the maximum velocity, seem to be explained by the fact that the rising tide is heaped up as it were at the mouth of the river by the dynamic force of the flowing stream at the end of the preceding ebb, and when this force is at last overcome and the slope reversed the impeded flood waters are propagated up stream in the form of a wave of translation, filling first the main deep channel of the river where the frictional resistance is least, and as the tide rises spreading over the banks and adjoining flats with a velocity retarded by increased friction.

The velocity curves show that the flood tide continues to run in at a uniformly decreasing velocity for an hour and a half after the water has reached its highest level, and slack water does not occur until the level at the gauge has fallen three-tenths of a foot both at the yard and arsenal. This last effort of the impetus acquired by the flowing liquid is evidently expended in filling up the extensive and distant coves above the yard, and in piling up the waters at the upper contracted part of the tidal portion of the river, as shown by the gauges at the railroad and Benning's bridges registering a higher level by more than one-tenth of a foot than at the navy-yard and Arsenal Point (see Fig. 5).

The ebb tides are not distinguished by any of the peculiarities pointed out in the foregoing remarks as pertaining to the flood, except, as shown by the curves, that the water continues to run ebb after reaching the lowest level, and until its surface has risen one-tenth of a foot on the gauge. This is due—as remarked before—to the dynamic force of the outflowing waters while expending their last effort in opposing the flood-wave approaching from an opposite direction. The tide curves at the four stations (Fig. 5) show a well-defined surface slope during the whole duration of the ebb flow, and the current curves are a clear illustration that the velocity increases with the slope of the surface, the maximum speed coinciding with the maximum fall. During the flood, the slope and velocity (Figs. 3 and 5) are at variance. The maximum velocity of the flood current at the navy-yard (Fig. 3) is 2.25 feet per second, and that of the ebb current 2.01 feet per second, the latter being 0.89 of the former. This might be accepted as an indication pointing to the accuracy of the foregoing statement, that the sedimentary matter brought up by the flood tide is greater in amount than that carried down by the ebb. But the flood current attains its maximum speed as if by an impulse, at a time when the rising tide has ascended but 0.44 of its total range, and this high velocity is retained only for a comparatively short time, after which the momentum acquired by the moving waters seems to be sufficient to overcome the resistance of gravity in raising the whole mass to the remaining 0.56 of the height and the velocity gradually falls to nothing. The ebb current, on the other hand, increases less rapidly. It takes fifty-two minutes to reach the velocity acquired by the flood in the first thirty-four minutes of its flow, but the steady increase of velocity seems to be more uniform and consistent with the head to which it is due. The maximum speed is not acquired until the waters have fallen 0.76 of the total height, and when attained it is preserved for a longer time than in the flood, so that the momentum required by the receding waters is expended during the interval of two hours, in re-

ducing the level 0.15 of the height, and in an effort toward overcoming the initial velocity of the returning tide. It remains to be seen, therefore, whether the fact of a higher speed in the flood than in the ebb can be accepted as conclusive evidence that the scour, or accumulated work performed by the former is larger than that accomplished by the latter. With this object in view, the bottom velocities, as obtained by calculation from the surface velocities, have been plotted in the diagram for both the navy-yard and arsenal stations. It has been assumed that a bottom velocity of one foot per second is required to lift and carry forward light sand and clay recently deposited, and that all bottom velocities equal to and greater than the adopted unit will be capable of performing a certain amount of scour of the material taken as a basis or in heavier deposits, while all velocities below that unit will have no effect, or the current will exert its influence only on lighter sediment held in suspension. Acting on these premises, the correctness of which will not, however, affect the ultimate results, since the latter are not intended to have an intrinsic value, but are presented only as an illustration of the relative effects produced by the same forces acting under similar conditions, and since we know that the scour increases with the square of the velocities, the curves of *work* for both the flood and ebb tides at the two stations have been constructed, the vertical scale having been very much distorted to avoid confusion of lines (see Fig. 4). At the navy-yard, the areas contained within the ebb and flood curves above the one foot velocity are in the ratio of 160 to 307, or in other words, the *work* performed by the former is only 0.52 of that performed by the latter. At the Arsenal Point the same areas stand in the ratio of 851 to 936, or the scour of the ebb tide is but 0.91 of that of the flood.

The difference in the ratio of the accumulated *work* done at the two stations is explained by the fact that the volume of water flowing in and out at the yard station is but 76 per cent. of that passing through the sectional area of the estuary at the Arsenal, and as a consequence thereof the area of the main channel at the latter is, as might well be expected, found to be 12 per cent. greater than that at the navy-yard (see Figs. 1 and 5, Plate 6).

It is quite interesting to observe how closely these results verify each other, and that the correctness of the conclusions advanced at the outset, as suggested by the relation between the duration of the flood and ebb, is also confirmed by the ratio of the accumulated work, or capacity for work, of each tide. The term *work*, as used here for convenience, is not intended, as before remarked, to represent the cubical contents of sedimentary matter carried up or down the stream by the tides, or the material deposited in the channel through a lack of transporting power in the flowing waters. The curves are only given as an illustration of the relative capacity of the currents to accomplish work under certain conditions; beyond that they have no meaning. The shaded areas represent the product of two of the variable factors entering into the calculation, viz, velocity and time; the other factor, resistance, is constant, and can be eliminated without destroying the relation sought.

The amount of material referred to as being transported or deposited is dependent on the quantity of sedimentary matters held in mechanical suspension by the waters, which in the present case are obtained from two distinct but similar sources, and are due to two causes. The sources are the Potomac River and the Eastern Branch, the waters of which are being constantly intermixed as they are moved up and down the streams by the tidal oscillations. The causes are, first, the force of the current in those streams due to both the tides and land floods and its

power to hold in suspension and transport earthy matter, and second, the drainage of the two watersheds. The quantity of material proceeding from the latter cause is a function of both the amount of rainfall in a given time and the condition of the surface drained, and may be estimated by the turbid character of the surface of the water after every continued or violent rain. Through the influence of these several causes the condition of the water as to turbidity is constantly changing. Thus the streams may one day be charged with sediment to their maximum capacity, and on the next the waters may be comparatively free from earthy matter, or the waters of the river may be very turbid, while those of the "Branch" are much less so, but upon being mixed by the tides, new and variable conditions result. Any attempt therefore, having for its object the determination of the quantity of sediment contained in the river at this locality, would be involved in much labor and uncertainty, and no practical or useful result could be reached.

The foregoing discussion seems to conclusively establish, that unless the present regimen and conditions of the river are modified, the process of silting will continue, and water communication with the yard will be greatly impaired, or practically cut off within a limited period.

The method here proposed for the improvement of the channel—for its permanent enlargement—is based on a concentration of the flood-waters in a scouring basin, embracing a superficial area of 73,502,765 square feet, or 66 per cent. of the total tidal portion of the estuary, and then to discharge the stored waters at a high velocity during the ebb tide, through a channel where they may flow with the least frictional resistance, and possess a scouring energy much greater than that of the flood-tide moving through the whole estuary, a velocity sufficient, it is believed, to scour and carry forward the sedimentary matter composing the bed of the river, so forming a deep and wide channel, and an established equilibrium between the current and the material. It is proposed that the navigable channel shall be confined on its southern margin by a longitudinal dike or bulkhead of sheet piling, extending from a point above the navy-yard to the end of the bend at Buzzard Point, and on the north side by the yard wharves and by short sections of dikes connecting projecting points in the banks. (See Plate 1.)

It is to be regretted that the present tortuous channel cannot be rectified by cutting off its sharp bends and establishing instead a more direct passage from the yard to the Potomac. Such a radical change cannot, however, be made, without serious interference with the riparian rights of lands abutting, nor without interfering very materially with the propagation of the flood tide. The bends, however, have been made less abrupt than they now are, the general direction improved, so far as the controlling circumstances will permit, and although the channel embraced by the training dikes may not be, apparently, of as easy access to navigation as a more direct one, yet the fact cannot be overlooked that in a straight channel the water has a tendency to deviate or oscillate from side to side, and thus produce shoals and bends in the *thalweg* injurious to navigation, while in a curved channel the centrifugal force keeps the current constantly against the concave bank, where the greatest uniform depth is always found.

It has been thought advisable to extend the training dikes to the bend opposite Buzzard Point, in order that the confined waters may continue to exert their scouring power and preserve the required depth to that point. It will be observed from the chart, that the deepest water between the yard and the Arsenal is found opposite that point. Both the enlarged sectional area and the bend in the channel are due

to the concentration at that point of the ebb and flood tidal currents approaching from different directions, as represented by the arrows in Figs. 7 and 8. On the turning of the tide to flood, the water follows the line of least resistance, flowing through the main channel at a high velocity and spreading over the flats with a current retarded by friction. But as the level rises, the waters covering the extensive flats extending from Giesborough Point to the Asylum wharf, flow in lines concentric with the bank toward the lower level up the Branch, and impinging against the main channel opposite the Point, press, as it were, the fluid mass against the bank, causing a diversion of the main channel toward the right bank of the river. During the ebb a like effect is produced by similar causes acting in the opposite direction. The receding waters from the flats of the Branch, being deflected by Poplar Point, are thrown against the stream moving down the main channel, and the accumulated waters thus compressed are forced in the direction of the resultant of the combined forces, which lies in the channel previously occupied by the flood waters. This explains, and is also confirmed by the anomaly observed in the sectional area of the channel opposite Buzzard Point (see Fig. 4, Plate 6), that shows deepest water toward the convex side of the bend and the action of the centrifugal force on the concave side limited to the six-foot curve. It explains also the persistent formation of the bar opposite the saw-mill. The alternate action of the tides, the flood wearing the left bank and the ebb the right bank of the channel, combine to form an enlargement of the sectional area, where the scouring action of the current is limited to the depth of 13 feet. The proposed plan will alter the present conditions, inasmuch as all the ebb waters will be concentrated in the main channel, and therefore the necessity of continuing the regulating dikes to the end of that curve.

The flushing or scouring basin will be bounded by the dike on the south side of the channel to a point opposite the saw-mill wharf, and from this point by a line of gates to Poplar Point. At the upper end of the dike above the yard, the channel will be in communication with the basin so as to permit the flow of the waters in the main channel at all times. It will be observed, however, that the proposed plan does not involve the discharge of the stored waters at or near the level of low water, with the high velocity due to the increased head. That system would require a construction more costly and complicated in design than is now contemplated, and the final result might not justify the expenditure involved. The system of scouring by directing a stream of water with a high velocity directly upon a particular spot, may be found effective in removing deposits from a determined place, to be again deposited at a distance below. In the present case a moderate amount of water confined in a well-proportioned channel, will be found quite ample to produce current sufficient in bottom energy to effect the object in view. A velocity of one foot per second will suffice to remove the light material composing the bed of the stream, but the current should be as uniform as possible, otherwise its effect might prove injurious instead of beneficial, since local commotion can only be produced at the expense of power, and the heavy material removed by an impulse of the current at a given point will be deposited at some other where the velocity is less.

It is the object therefore to leave the basin permanently open to the channel, both for the influent and effluent waters, or in other words, the channel will be an integral part of, and may be regarded as an extension of the basin. By the flood tide, the whole basin of the Eastern

Branch above Poplar Point will be filled as now, the waters moving to fill this reservoir through a sectional area of 11,066 square feet at mean tide, while the flow of the ebb over the flats will be stopped by the gates, and the outlet will be restricted to the new navy-yard channel inclosed by training dikes, and having a mean sectional area of 7,308 square feet.

The basin will have a total superficial area of 73,502,765 square feet. Of this amount 67,671,565 square feet are comprised in that portion of the tidal compartment of the river where the mean range of the tide is practically the same as that determined by the observations at the navy-yard, viz, 3.1 feet; the remaining 5,831,200 square feet of the superficial area embrace that portion of the river where the gradual rise of the bed above the plane of low water reduces the rise and fall of the tide to an average of one-half the mean, or 1.55 feet. We have therefore the cubical contents of the tidal prism contained in the basin at mean high water 218,820,211 cubic feet. To this amount must be added the ordinary drainage of the water-shed of the Eastern Branch during the ebb. This discharge is 3,650 cubic feet per minute, which into the time, six hours and twenty-one minutes (the duration of the ebb as shown by the current observations), gives a total discharge of 1,390,650 cubic feet. Adding the cubical contents of the tidal prism, 218,820,211, we have total discharge of basin during ebb flow = 220,210,861 cubic feet, which divided by the time, six hours and twenty-one minutes, the duration of the tide, will give 9,633 cubic feet as the mean discharge per second on the basis of a steady flow. It is proposed to impart to the ebb tide a maximum velocity of 2.50 feet per second, and this, divided by a coefficient, will give the mean surface velocity from which the mean velocity of discharge and the proportional sectional area can be obtained.

Rankine gives this coefficient 1.57 for both the ebb and the flood current. Our current observations at the yard and arsenal wharf give the following results:

Velocities at the yard.

<i>Flood</i>	Maximum, 2.250.	Mean, 1.392	
			$\frac{2.250}{1.392} = 1.617$
	Maximum divided by mean,		
<i>Ebb</i>	Maximum, 2.010.	Mean, 1.324	
			$\frac{2.010}{1.324} = 1.518$
	Maximum divided by mean,		
and	$\frac{1.617 + 1.518}{2} = 1.568$	the mean coefficient.	

Velocities at the arsenal.

<i>Flood</i>	Maximum, 2.800.	Mean, 1.758	
			$\frac{2.800}{1.758} = 1.596$
	Maximum divided by mean,		
<i>Ebb</i>	Maximum, 2.630.	Mean, 1.691	
			$\frac{2.630}{1.691} = 1.556$
	Maximum divided by mean,		
and	$\frac{1.596 + 1.556}{2} = 1.576$	the mean coefficient.	

Rankine's coefficient of 1.57 as a mean for both the ebb and flood current is, therefore, verified by these observations, which it may be proper to add were simultaneously taken at intervals of ten minutes,

and with all the requisite care to insure accurate results. For our calculations we will use the constant obtained from the ebb-current observations at the navy-yard:

assumed maximum surface velocity = 2.50
 constant for ebb current = 1.518 = 1.647 mean surface velocity, instead of 1.392 for the flood and 1.324 for the ebb as obtained from our observations.

From this mean surface velocity we can obtain the mean velocity of the flow and the velocity of the bottom by the following formula:

$$V' = (\sqrt{v}-1)^2 = \text{mean bottom velocity.}$$

$$V'' = \frac{(\sqrt{v}-1)^2 + v}{2} = \text{mean velocity of the flow, in which } v =$$

mean surface velocity in inches per second; hence $(\sqrt{19.764}-1)^2 = 11.868$ inches = 0.989 feet per second, the bottom velocity, and

$$V'' = \frac{0.989 + 1.647}{2} = 1.318 \text{ mean velocity.}$$

The mean discharge per second divided by mean velocity will give the required area of channel to carry off the stored waters at a

maximum surface current of 2.50 feet per second, hence $\frac{9633}{1.318} = 7.308$

square feet = the sectional area. With this sectional area there will be at each ebb tide an interval of three hours and fifty minutes in which the bottom velocity will be between 0.989 and 1.687 feet per second, with a sufficient scouring power to lift and carry forward material as heavy as coarse gravel. It is reasonable to expect that, with such a current, acting for nearly eight out of the twenty-four hours of each day in a well-proportioned channel where the waters are confined and guided so as to exert their whole influence on the bottom and sides of the stream, no danger of additional deposits from any source need be apprehended. The bed of the river is composed of sand and clay, and this light material once lifted by the current will not be deposited again in any portion of the channel. A portion of it may be deposited on the flats and eddies in the wide parts of the main river, and other portions may not find rest until they have reached the sea.

As to the land floods, their effect will be to rather increase than impair the efficiency of the channel. The enlarged volume will cause a proportional increase in the scouring, and the material brought down by the flood waters will be moved forward without injury to the channel.

It may be seen from the tidal curves represented in Fig. 5 that the total surface slope between the navy-yard and arsenal during the ebb is not at any time greater than one-tenth of a foot. Making the necessary allowance for the increase of head due to a greater velocity, the level of the water confined in the basin will not at any point stand more than two-tenths of a foot above that outside. The design for the dikes and gates, therefore, must be more with a view to an expeditious working of the latter, and to the economical construction and durability of both, than to the pressure they may be called upon to withstand.

The proposed dikes will consist of one row of round piles 12 inches in diameter, varying in length from 15 to 20 feet, driven 8 feet between centers, and connected by two 6 by 6 inch string pieces, to which one row of 3-inch planks closely driven to an average depth of 14 feet will be firmly spiked. The top of the planking, or sheet piles, will project

to the plane of mean high water from the head of the channel above the yard to the line of gates or lower end of basin, and 6 inches below that level from the latter point to the end of the dikes at Buzzard Point.

In constructing the dikes through the wide shallow channel opposite the saw-mill wharf, a second row of piles 20 feet long and 8 feet between centers will be driven in the rear of and 10 feet distant from the first row, to which they will be connected by 6 by 8 inch cross-bracing, so as to resist the additional pressure that may arise from sedimentary deposits behind the sheet piling. This construction is both inexpensive in its original cost and future preservation, and will be found to answer the purpose intended.

Great care and judgment must be exercised in the location and design of the gates, in order that the propagation of the flood-tide and the flood outlet of the river may be retained. The openings of the gates, therefore, should be as large and free as may be consistent with sound principles of construction, and the intermediate piers of no greater dimensions than the stability and management of the gates may require.

Several systems suggest themselves as applicable, but whichever method may in the end be adopted, whether the gates be worked by hand or made to act automatically by a judicious utilization of the periodic rise and fall in the level of the water, provision must be made to manipulate them as the circumstances may require in times of flood, so as not to obstruct the outflow of the water on such occasions. The level of the water being practically the same on both sides, the purpose of the gates is only to arrest the flow and divert the ebb, now in part dispersed over the flats, into the main navigable channel. Their desiderata may be stated as follows: lightness, ease of manipulation, minimum surface exposed to the action of the wind, with a reduction to the minimum of the tendency of ice to impede their free motion and affect their service. The requirements as to manipulation are that they shall close at high water and so remain until the beginning of the next flood, when they must open and so remain during the entire flood, closing again at the beginning of the ebb. In other words, they are to arrest the flow of the ebb entirely, while on the other hand they are to offer the least resistance to the flood tide.

There is a vast field open to discussion as to the best method of meeting all the necessary conditions, and although the one here proposed is open to improvement in its minor details, and may not, after further investigation of the subject, prove to be the most advantageous, yet it is believed to possess sufficient merit to entitle it to consideration as one of the many solutions of the problem.

The description of the gates may be conveniently and naturally divided into two parts, viz, the substructure supporting and inclosing the gates, and the gates themselves with attached mechanism for working. The former it is proposed to construct as follows: The gate openings, $20\frac{1}{2}$ feet in the clear, will be separated by piers, every alternate one being $2\frac{1}{2}$ feet wide, and consisting of four piles supporting the tanks containing the device for operating the gates. The intermediate pier will be merely a single pile 8 inches in diameter. A sill for the gates to rest on when closed will connect the piers at the bottom, a row of short 3-inch sheet piles being driven against the sill to prevent scouring underneath.

It is intended to operate the gates in pairs, and the proposed method of construction and operation is thus described: The gates to consist of slats of galvanized iron $\frac{1}{4}$ inch thick and about 1 foot wide, suspended

by pivots from the piers at both ends—as are the movable slats of a window blind—operated by eight connecting rods, four on each side, fastened to a hollow shaft revolving in bearings resting on the piers and tanks. (See Fig. 9.)

Between the piles of the large piers, and firmly bolted to them, will be placed a galvanized iron tank containing the floats and valves by which the gates will be operated, and the sides of the tanks properly stiffened will support the shaft. Attached to the shaft will be a rigid arm, which, connected to the float in the tank by a suitable link, is raised or lowered by the alternate motion of the float as the water rises or falls, turning the shaft one-quarter of a revolution and thereby closing or opening the slats composing the gates.

The interior of the tank will be divided into two compartments, the larger of which will contain the float and have communication with the water outside only as regulated by the valve. The smaller will contain the automatic valve by which the admission and escape of water to and from the float compartment will be controlled, and will have free communication with the water outside.

The valve is connected to a pipe leading from the bottom of the float compartment, and will discharge or admit the water in the tank as controlled by the automatic arrangement. The valve has an arm connected to a small vertical iron rod rising to the top of the tank, where it passes through a sleeve, and having two stops so placed that when either is brought in contact with the guide-sleeve the valve will be closed, and when the gate is midway between the stops it will be wide open. On this rod, or valve-stem, works a combination of three floats (see Fig. 10); two spherical wing floats and one small or traveler float playing freely on the valve-stem. The large floats of the combination are attached to arms of a short lever, the inner ends of which are sharpened to enable them better to grasp the valve stem—as does the pawl its ratchet. The fulcrums of these levers play in slotted bearings at the sides of the traveler float, and are held against the inner end of the slot by rubber springs, as shown in the sketch. Each float will be so constructed that the weight will equal its buoyant power when entirely submerged, and the three, if removed from the valve-stem, will float with their centers of gravity in the plane of the surface of the water, and the short levers also lying horizontal in the same plane.

The principal difficulty, met with in all devices suggested for utilizing the rise and fall of the tide as a motor for the automatic operation of the gates, has been to hold back, as it were, the gradual effect of this rise or fall acting through five or six hours, and compel it to exert its influence at the instant of the first impulse of the ebb or flood. This difficulty, it is hoped, has been overcome by the device described above, suggested by Civil Engineer R. E. Peary, U. S. N. The action is made clear by an examination of the sketch, Fig. 10. Starting at low water, the valve open and the valve-floats in the position shown at A and B, the water outside and in both compartments of the tank at the same level, the large float down and the gate-slats open: the tide begins to rise, and as it does so the floats cause the sharp ends of the lever *l* to clamp or fasten themselves upon the valve-stem *s*, raising it as they rise, thereby closing the valve *v*, and bringing the lower stop *a* against the guide-sleeve *g*, at the top. As the tide continues to rise, the floats, unable to ascend at first, become more and more submerged, until their buoyant power becomes stronger than the tension of the spring against which they react, when the pivots *p, p*, slide outwards in the bearings,

the floats rise to and pass the horizontal, the springs force the pivots back to the inner end of the bearings, and the floats assume the position shown by the dotted lines, and rise with the water without further resistance. When the tide reaches its full height the difference of level between the water outside and inside the float compartment is equal, of course, to the range of that tide. The moment the tide begins to fall, the chisel points clamp the valve-stem, and the weight of the floats being thus transferred to it, opens the valve and allows the water to rush into the float compartment, raise the float and close the gates. The valve-stem still descending, closes the valve and brings the upper stop against the guide. Unable to descend further, the floats remain stationary until their weight overcomes the springs and they descend, the pivots, spreading, take the former position and slide easily down the stem with the tide, till it begins to rise again, when they open the valve, the large float descends and the gates are open. In times of freshet the floats will retain their highest position, keeping the gates open and allowing the water to flow through and over all without resistance. On the subsidence of the waters, the regular operations as described above will be resumed.

The total obstruction to the propagation of the flood-tide by the gates and piers is but one-seventh of the sectional area of the flats, which is more than compensated by the increase of area in the main channel, so that there is no reason to expect a higher velocity in the flood-current.

ESTIMATES.

The cost of this improvement may be stated as follows:

DIKES.

325 main piles, 12" diameter, 20' long, at 8 cents per foot	\$520 00
1,250 main piles, 12" diameter, 15' long, at 8 cents per foot	1,500 00
325 bracing piles, 12" diameter, 20' long, at 8 cents per foot	520 00
28,000 linear feet white oak, 6" × 6" for stringers = 84,000 feet, at \$16...	1,344 00
2,600 planks, white oak, 3" × 12" × 18', for sheet piling = 140,400 feet.	
10,000 planks, white oak, 3" × 12" × 10', for sheet piling = 300,000 feet.	
440,400 feet, at \$16	7,046 40
325 braces, white oak, 6" × 8" × 12' = 15,600 feet, at \$16	249 60
56,000 pounds $\frac{5}{8}$ and $\frac{3}{4}$ inch spikes, at 4 cents	2,240 00
Total for materials	13,420 00

LABOR.

Driving 1,900 piles, at 15 cents per foot	\$4,762 50
Driving and spiking planking, at 8 cents per foot	11,744 50
Spiking stringers	1,050 00
Spiking 325 braces	243 75
Cutting spikes	834 00
Handling material and tools	2,000 00
Total for labor	20,634 75
Total for materials	13,420 00
Total	34,054 75
Add 10 per cent	3,405 25
Total for dikes	37,460 00

GATES.

120 piles, 12' diameter, 20' long, at 10 cents	\$240 00
1,400 linear feet white oak, 6" $\times$ 6", for sills, at \$16.....	67 20
12,000 feet, B. M., white oak, 2" $\times$ 12", for sheet piling, at \$18	216 00
12,000 feet, B. M., white oak, for various purposes, at \$18.....	216 00
150,000 pounds galvanized iron for gates, tanks, &c., at 10 cents.....	15,000 00
Erection	6,000 00
	21,739 20
Add 10 per cent.....	2,173 80
Total for gates	23,913 00
Total for dikes	37,460 00
Grand total	61,373 00

This amount is regarded as sufficient for the proper construction of the dikes and gates as described above, but provision must be made for a certain amount of dredging, which will eventually be required to remove indurated lumps likely to be met with, and to assist the scouring in giving the new channel a sectional area sufficient to navigation and the purposes of the yard. Figs. 1 to 5, Plate 6, represent the actual cross-section of the river at the four stations marked 1, 2, 3, 4, and 5, and the dotted lines the proposed sectional area enlarged by the scouring power of the current after the improvements are completed; but it is to be expected that unless all obstructions to the uniform flow of the water are promptly removed, the deflected current will be the cause of contraction and eddies, with a consequent loss of power and want of uniformity in the width and depth of the channel. The amount of dredging required for that purpose cannot be estimated now with any degree of accuracy, but the additional sum of \$40,000 will, it is believed, be ample to cover all contingencies under that heading. To accomplish the object proposed by the improvements by dredging alone, no less than \$250,000 would be needed at the outset, and for maintenance of the channel an additional annual expenditure which cannot be estimated at less than \$20,000, or a much larger amount in proportion if the silt is allowed to accumulate for a considerable length of time.

As to the permanency of the works proposed, it may be said that for the first ten years they will need little or no repairs; after that length of time the wood above the mean level of the water may require general but inexpensive repairs for the preservation of the dikes in their proposed form. It is probable, however, that after the equilibrium between the current and the material composing the bottom is fully established, and the channel enlarged to the proposed dimensions, the banks formed by the deposits on the outside of the dikes will answer the purpose of guiding the water, and will contribute to the maintenance of the channel. The gates, being constructed of galvanized iron and submerged timber, should last for many years, and the occasional repairs that may be required from time to time can be provided for at a small annual outlay. It is believed that when the channel has reached the dimensions proposed no further dredging will be needed, the scouring being sufficient for its preservation.

The method of improvement herein suggested has reference to the channel leading to the yard only, in which it is supposed the members of the Institute are particularly interested; but it may be proper to add, before closing, that the benefits pointed out as likely to be derived by the yard as the result of the proposed works may be made extensive to the Uniontown side of the river.

When the yard channel has been enlarged to the proposed dimension, the subsequent work of the current will be to maintain the established equilibrium and prevent future deposits. Under those favorable conditions the scouring action of the current may be suspended for a limited time, and on being restored, the newly accumulated sediment will be at once swept out by the current, somewhat strengthened by reason of the reduced sectional area and the stable condition of the channel restored. It is evident, therefore, that if another channel be confined by similar constructions along the water front on the south bank of the river, a portion of the stored waters might be diverted from time to time, as circumstances require, from the main or yard channel, and thrown into the other, where they would exert on the bottom a scouring influence greater in proportion to the reduced sectional area. In this manner the waters might be made to oscillate without any waste of power to the great commercial and sanitary advantage of all concerned. Additional facilities would be offered by this combined system of improvement to the propagation of the flood tide through the south channel, and as the storing area of the basin would remain practically the same, a marked decrease may be expected in the flood current, with a proportional loss of sedimentary carrying capacity.

The two parallel broken lines along the south bank of the river indicate the probable location of that channel so as to best serve the purpose intended. It is supposed that a water-way 150 feet wide at the bottom and 10 feet depth at low water will be sufficient to meet the business interest on that side of the river for many years to come, and those are the dimensions estimated upon. The channel is laid on an easy curve in front of the town, and then by a straight line carried across the alluvial low land at Poplar Point. This is done in order not to interfere with the flood gates, and to avoid an abrupt bend around that point. After crossing Poplar Point the channel is taken by an easy curve into the main channel above Buzzard Point, a location which it would necessarily take by reason of the diverting influence of the flood waters proceeding from the flats to the south. Between Poplar and Buzzard Points the dikes will be kept at or below the level of mean tide, so as not to obstruct the flow of the flood waters. The estimated cost of this improvement, including dikes, gates, probable dredging, &c., is \$50,000, a very small amount when we consider the commercial and sanitary advantages to be derived therefrom.

NOTE.—Subsequent to the completion and reading of the foregoing paper, the report of a Board of Commissioners (appointed by the honorable Secretary of the Navy, in pursuance of an act of Congress dated March 3, 1827, for the purpose of establishing a plan for the improvement of the Washington navy-yard) has attracted the attention of the writer.

While the river was frozen over the depth of water throughout the whole front of the yard—1,700 feet in length by 500 feet in width—was very carefully measured by soundings through the ice every 50 feet. The depth is noted in a chart, signed by L. Baldwin, engineer, and was submitted by the Board to the Secretary of the Navy.

On each of the first four diagrams herewith (Plate II) are shown :

1. The outline of the bottom of the channel in front of the yard wharf as represented in the chart prepared in 1828 under direction of the commandant of the station and the Board of Improvements.

2. The outline of the bed of the channel as shown by the Coast-Survey chart of 1842.

3. The outline of the channel bed as found by the survey of 1882.

On Fig. 5, the outline of the bottom of the channel as determined by the surveys of 1842 and 1882 are only given; the survey of 1828 not extending to that point.

The depths have all been reduced to the same datum—mean low water—and as the line of the wharves has remained unchanged since the earliest survey, there can be no doubt that the widths and depths of water are correctly represented.

Again, as the dredging appliances in use during the first quarter of this century were very rude and ineffective, there can be no doubt that the sections found in 1828 represent the true regimen of the channel.

It will be seen that the survey of 1842 shows a considerable reduction in width and depth, while the chart for the present year indicates a most marked reduction, very nearly 45 per cent. in area since 1828, in front of the yard, and 40 per cent. in front of the saw-mill wharf since 1842. It must also be borne in mind that from 1850 to 1869 the dredge was extensively employed in deepening and widening the channel, not only in front of the yard, but all along where necessary, to the arsenal, but since 1869 no dredging has been done.

The record of these surveys is submitted in proof of the assertion that the natural tendency is to a rapid silting and shoaling of the channel.

DISCUSSION.

Capt. R. L. HOXIE, Corps of Engineers, U. S. A.:

Mr. CHAIRMAN: I have read with a great deal of interest the paper submitted by Mr. Menocal, but have not had time to consider the subject with that degree of care which its importance requires. My late arrival this evening prevented me from hearing the reading of the paper before the society, and I can speak only from the recollection of the impression made several days ago. At that time I saw nothing in Mr. Menocal's premises or conclusions to which I could take exception. The argument appeared to be sound and the plan quite feasible, with probable success. This evening, for the first time, I have examined the charts and diagrams explanatory of the contents of the paper, and these suffice to renew the first impression.

I say this notwithstanding a violent prepossession in favor of *filling up* all tidal areas in close proximity to the city, and for this reason: Mr. Menocal's plan is one for the improvement of navigation without detriment to existing sanitary conditions. It will probably effect the improvement of navigation at a minimum of cost and within a reasonable time. This being accomplished, the problem of filling up these areas is advanced one step. The condition of *maintaining* the necessary channel to the Navy-yard takes the place of the present condition of *creating* and maintaining it. This condition is, of course, imperative if the yard is to be preserved.

I have no reason to suppose that a closer scrutiny of Mr. Menocal's paper would compel me to challenge any of his conclusions.

Capt. GEORGE W. DAVIS, U. S. A.:

Mr. CHAIRMAN: Mr. Menocal's paper has greatly interested me, and I believe will be regarded by engineers as a valuable professional contribution. His observations on the tidal action of the Anacostia are most instructive, and his verbal explanations of the maps and diagrams exhibited have been most helpful to a full understanding of the problem which he has studied so industriously.

It has long been well known that the duration of the ebb tide in the Potomac River near Washington much exceeded the flood, and taking into account the ordinary river flow, something like one hundred millions cubic feet of water for a single tide, it is naturally inferable that the tidal and fluvial currents combined would suffice to keep the channel free from sedimentary obstructions. But in considering the subject, account must be taken of the millions of cubic feet of alluvium yearly brought down the Potomac from its water-shed, a large part of which is now denuded of the vegetation that once protected the land from wash. The effect of this deposition of sediment has been more marked over those wide areas known as the flats on either side of the main channel where the current is always more sluggish, than in the channel itself, but the weight of evidence tends to confirm the oft-repeated assertion that the channel depth is not only diminishing in certain places, but also being reduced in width. A confirmation of this statement is furnished by comparing the channel di-

mensions shown on the Ellicott map published in 1792 with those of recent date. The flats in front of the city on both banks of the river have unquestionably been formed by the deposition of sediment.

The Anacostia branch of the Potomac is a wide and long basin into which the waters of the river flow, or back up, when the main stream is higher than the tributary, and so the silt carried in mechanical suspension is transported into what is in effect a receiving basin, not only for the sediment imported, but for that derived from its own limited shed. When in the course of ages all the flats within the tidal compartment known as the Eastern Branch shall have been raised to the level of high water, which must some time occur, the tidal movement will be limited to a narrow channel which itself would also be entirely closed but for the fact of its being the outlet for the drainage of something like one hundred square miles, comprising the water-shed of the Anacostia. What dimensions this channel would take it is not possible to determine. It certainly would not be navigable for sea-going vessels.

The causes which are at work to produce these results have of course been active for ages, but they have certainly been much more active since the denudation and plowing of the hillsides over large areas of Maryland and Virginia, and these silt-producing areas are certain to increase as the timber is cut down and the waters are thus likely to become more and more turbid.

The conditions that obtain here may be likened to those seen in the Sacramento, which a few years ago was navigable far above the city of the same name for large steamboats, but through the system of hydraulic or placer mining on the tributaries of that stream, millions of cubic yards of silt have been carried into the river, and the depth of water all the way down to the bay has been greatly reduced. So marked has the shoaling become at the Mare Island navy-yard that the use of the dredging machine has already become necessary, where a few years since was ample water for the largest ships. In the tidal compartment of the Eastern Branch above Poplar Point there is still storage room for some 218 millions cubic feet of water, and room probably for an equal amount of silt below low tide.

Mr. Menocal's plan contemplates the unrestricted flow into the estuary, under the influence of the flood tidal current, of the quantity of water required to fill the reservoir, moving through a cross-section of 11,000 square feet. Upon the turn of the tide he proposes to contract this cross-section and permit the exit of the water only through the ship channel having a sectional area of some 7,300 square feet, and so produce an ebb current so much more rapid than the flood that it will scour and sweep out the silt in the channel, and prevent the deposit of that held in suspension.

It seems to me Mr. Menocal has demonstrated the practicability of accomplishing this result. His estimate of the expense involved in the proposed improvement appears reasonable; it is for the Government to consider whether the navy-yard shall be allowed to remain ineffective or the channel restored. It has been stated that there has here been expended for construction and maintenance upwards of \$4,000,000.

The following named vessels of war have been built and equipped at this yard, viz :

Name.	Class.	Tonnage.	Built.	Maximum draft.
				<i>Fect.</i>
Columbus.....	Ship of the line.....	2,480	1819	25
Potomac.....	Frigate.....	1,726	1821	22
Brandywine.....	do.....	1,726	1825	22
Columbia.....	do.....	1,726	1836	22
Saint Louis.....	Sloop of war.....	700	1828	16
Saint Mary's.....	do.....	958	1844	17
Minnesota.....	Steam frigate.....	3,200	1854	24
Nipsic.....	Steam sloop.....	615	1874	.....

In addition to the above, many of our largest vessels have been extensively repaired and supplied with machinery and other equipments at this station.

Maj. PETER C. HAINS, Corps of Engineers, U. S. A. :

Mr. CHAIRMAN: Having been asked to give an opinion on the plan of improvement of the Eastern Branch proposed by Mr. Menocal, I will state that I have not had sufficient leisure to give the subject the study it requires; nor have I the results of the latest surveys made by Mr. Menocal at my disposal. In compliance with the above request, however, I will endeavor briefly to call attention to what appear to me, with the limited study I have given to the subject, its objectionable features.

The principle on which the plan seems to be based is, that the deposit of sediment is due chiefly to the action of the tides, the flood-tide taking in material which is deposited at slack water, and the lack of power in the ebb current causes it to remain in

place: in other words, there is a constant tendency to silt up stream, and that this silting up process is likely in a time not far distant to fill up the present channel and flats, destroying the former for purposes of navigation, and rendering the latter a pestilential swamp. Whether the river be filling up as rapidly as is supposed can only be established by a comparison of reliable surveys made at various times. I have no very recent surveys with which the older ones may be compared. Consequently, the data at my disposal are not sufficient to form a correct idea of the present condition of the river.

That the deposition of sediment is going on will be admitted without question, but that it is going on with such rapidity that dredging is to be regarded as a costly and unsatisfactory method of improvement does not seem to be conclusively proven.

Mr. Abert made an estimate of the cost of dredging a channel 100 feet wide on the bottom, with slopes of eight base to one vertical, together with a basin 1,250 by 300 feet in front of the navy-yard, to a depth of 18 feet at low tide, to be \$25,082. Dredged a depth of 20 feet at low tide, the cost would be \$47,544. The estimated amounts of material to be removed in each case were 121,170 and 229,680 cubic yards, respectively.

A channel 18 feet deep at low tide will admit vessels drawing 20 to 21 feet at high tide, and a channel 20 feet at low tide will admit vessels of 22 and 23 feet at high tide. The above estimates were made from data furnished by the Coast Survey Chart of 1862, no later surveys being available. Mr. Menocal estimates the cost of a dredged channel to be \$250,000, a sum vastly in excess of Mr. Abert's figures. This may be due partly to an increased deposit of sediment in the last few years, and a greater width and depth of channel to be dredged.

Unquestionably, a channel of the width proposed by Mr. Menocal is better than the one only 100 feet wide, but is it necessary? A channel 3,000 feet wide is better than one only 300 feet; but the benefits to be derived are not in proportion to the increased cost. In comparing the cost of a dredged channel with one made in any other way, the cost should be limited to the necessities of the case. I am not to be understood as necessarily favoring the dredging process. I only refer to it because I think Mr. Menocal, in comparing his plan with the plan of a dredged channel, has overestimated the cost of the latter.

I do not think Mr. Menocal has proved conclusively that the deposit of sediment is due to the silting up-stream alone. May not other causes have been active in producing the present condition of the river; and if so, is it not hazardous to plan an improvement without giving them due consideration?

The difference in velocities of the ebb and flood currents may be only a partial cause of the present condition of affairs. The difference that exists between the surface velocities of the flood and ebb tides may not be found in the bottom velocities. On the other hand, this difference may be greater or it may be less, and the error, if any, might be in favor of the plan or against it. The uncertainty of accuracy in the calculated bottom velocities is a strong argument, however, against a plan of improvement based partly, at least, on their calculated difference. It is not always safe, in a tidal stream, to accept as correct the bottom velocities deduced by formulas from observed surface velocities; the former are not unfrequently influenced by causes, the discovery of which baffles the most careful observer. A better way is to measure the bottom velocities themselves, and as this is a task by no means difficult, at least approximately, it should be done, to establish with certainty the accuracy of the premises on which the improvement is based. In order to modify the action of the forces of nature now in operation, so as to utilize them in any plan of improving navigation, it is important to get clear and precise ideas of their present action. I do not say that the calculated bottom velocities referred to may not be correct, but I do say it would have been better to have determined them by observation rather than by calculation.

Again, the dike proposed will undoubtedly prove to be some obstruction to the movement of the flood tides; it may not be great, but that it will be felt in a measure, at least, is certain. It will be impossible to locate the dike so that at all places it will conform to the direction of the current. This current doubtless varies its direction at different stages of the tide, and if the direction of the current be changed, changes in the regimen of the stream may be brought about that are neither contemplated nor desired.

Supposing, however, that the premises on which the plan is based be correct, that the deposit is due to the causes stated, that these causes are still in operation, the following objections occur to me:

The construction is too light. A dike built of 3-inch plank would be in need of continual repair; something more substantial would be necessary. One severe winter would be apt to demolish it, or at least damage it to such an extent that practically it would have to be rebuilt in the following spring. The inlet gates, being of light construction, will also be liable to damage at all times from drift-logs and other floating bodies.

There does not appear to be sufficient power in the automatic apparatus to operate the gates with facility and certainty at all times; grass, weeds, and sticks will become entangled in the leaves and prevent their proper working, or necessitate the services of a man to keep the apparatus in order. At night considerable difficulty would be found in doing so. The bearings, being of iron, would rust, and considerable power would be lost in overcoming the friction. I am not sure that sufficient reserve power is contained in the automatic apparatus to overcome this difficulty. During the winter the gates could not be operated at all. The ice that would form on the leaves would render their working difficult, if not impossible, and that which forms in the float-chambers would stop the working of the floats. It would, perhaps, become necessary to remove the gates entirely during one-fourth of the year, for this reason.

The above objections are not of such a nature that one can say the plan is not practicable, provided further investigation established the accuracy of the premises on which the plan is based; they point rather to the necessity of modification in construction, and show that the estimated cost of a plan of improvement that does not take these matters into consideration is defective and too low.

It is estimated that the piers and tanks from which the gates are to be suspended and worked interpose an obstacle to the flow of water as great as one-seventh the cross-section of the river on the flats, and that no higher velocity of the flood current may be apprehended than exists at present. But may we not expect a reduced velocity on the flats below the gates? An obstruction of one-seventh the area across the flats is a matter of some consequence, and while the velocity of water flowing through the gates may not be perceptibly increased, a retardation below will be apt to occur. In point of fact, however, I am of the opinion that the gates and the dam will obstruct much more than one-seventh the cross-sectional area, if built of the proper strength to insure stability, and this obstruction will be certain to produce a retardation of the current at some distance below the gates. We have a case similar to this in the main branch of the Potomac above Long Bridge. Since the bridge was built, dredging has become necessary every few years to keep open a navigable channel. The effect of this retardation of the current below the gates, and the increased amount of material scoured out from the channel on the ebb tide and held in suspension, will accelerate the deposit on the flats, which we are informed is already rapidly going on. The material scoured and carried out on the ebb tide will be dropped again as soon as the velocity of the current is sufficiently reduced. This reduction will take place immediately after the water escapes from its confined area between the dike and the shore. Some of it will doubtless be carried out beyond the mouth of the East Branch and deposited elsewhere, perhaps to the injury of some portion of the main river, while much of it will be dropped on the flats below the gates. The works thus intended for the improvement of navigation will bring about a sanitary condition of the flats worse than ever before. The reduction of the depth of water on them will be accelerated, and finally the flats will become too shoal to pass a sufficient amount of water over them, on the flood tide, to be of any use on the ebb. The gates will thus become useless and the improvement a failure unless dredging be resorted to. We would then have the flats to dredge instead of the channel. When it is a question of dredging, the general opinion will be that it will be found more satisfactory and economical to dredge the channel than to dredge the flats.

It is already claimed that the flats of the Eastern Branch will have to be reclaimed from overflow, as a sanitary measure, at no distant day; that they have already approximated to that malarial condition necessitating it. While I do not admit or deny, at the present time, the truthfulness of this statement, I do admit that it may become necessary, at some future time, to adopt measures to prevent their overflow at high tide. Hence, in planning any improvement for the navigation, due regard must be paid to its possible effects on the sanitary condition of the flats. If it should tend to render their condition worse than they will become by the operation of natural causes, or if the plan does not admit of the possible necessity of reclaiming the flats from overflow at any future time, it should not be adopted.

Civil Engineer S. T. ABERT:

Mr. CHAIRMAN: I would like to ask Mr. Menocal one question in reference to those curves: Whether it is safe to base his theory upon surface velocities for determining the direct tidal power and the difference of the tides?

The surface velocity does not afford a certain guide to determine the subsurface velocities.

The velocities in the vertical section sometimes conform to a parabola, or an ellipse; often they vary from these curves even in a river purely fluvial. But in a tidal river the velocity at the surface is often flowing down stream when the subsurface velocity is in the contrary direction.

Civil Engineer A. G. MENOCAL, U. S. N.:

Mr. CHAIRMAN: I will briefly reply to the interesting remarks of Major Hains,

touching only on those points in his discussion which I believe to be based on a misapprehension of the facts, or on which we widely differ in our conclusions.

Skilled and experienced naval officers are of the opinion that, considering its tortuous course and tidal current, the channel leading to the yard cannot satisfy the requirements of the station with a width of less than 250 feet from the yard to its junction with the channel of the Potomac, and at least 325 feet wide in front of the yard, with a mean depth of 20 feet below the plane of low water.

Under the present condition of the river, a channel of those dimensions, together with the necessary excavations in the slips, would involve about one million of cubic yards of dredging, which, considering the difficulties attending the disposition of the material, cannot be estimated at less than \$250,000. Should the width be reduced to 300 feet in front of the yard, and 200 feet from the yard to the main river, the amount of material to be excavated would be 692,011 cubic yards, and its estimated cost \$173,000, or \$73,000 in excess of the estimated maximum cost of the improvements I have proposed. A channel of smaller dimensions will fail to meet the needs of the service.

If other causes than those adverted to are actively at work in producing the present condition of the river, they have not been discovered, and any suggestion specifying those causes or influences would have been received with favor as a basis for further investigations.

It is with the present condition of affairs that I have had to deal in these investigations, and actual conditions, as I see them, have determined my conclusions, the correctness of which have been established by comparing the last survey with others made many years earlier, as shown in the diagram illustrating the note accompanying the original paper. I admit that it would have been very interesting to obtain by actual observation, at least approximately, the bottom velocities; but I cannot perceive in what manner the results obtained could have materially altered the premises established or the conclusions arrived at. The calculated bottom velocities, deduced from the observed surface velocities, were used in the discussion intended to show the relative scouring power of the tides, and whatever error might be involved in the application of the formula employed, it was common to both tides, its effect was eliminated in the operation and could not alter the result. Observations for bottom velocities demand much labor, and the results are at best uncertain. However satisfactory any effort in that direction might have been, it would have proved of little or no practical value in designing the new channel, or determining, even approximately, the probable bottom velocity as deduced from an assumed surface velocity. For that purpose I would, most certainly, follow the practice of the most eminent hydraulic engineers, and adopt one of the formulæ established by recognized authorities on the subject.

Major Hains correctly states that it is not always safe in a tidal stream to accept as correct the bottom velocities deduced by formulæ from observed surface velocities, and that the former are not unfrequently influenced by causes, the discovery of which baffles the most careful observer. This remark probably refers to the undercurrent observed in some situations within the influence of the tide, such as the river Dee at Aberdeen and the Cromarty Firth; but these phenomena, although somewhat obscure, have generally been traced to the configuration of the bottom, a marked contraction at the entrance of the estuary or river, or a decided difference in the density and temperature of the tidal waters; conditions which do not obtain in the present case.

The dike has been located so as to conform to the direction of the flood current, as marked by the present channel and the current observations taken for the purpose, and I can see no reason for apprehending any injurious obstructions by it to the propagation of the flood tide.

Major Hains asserts that the construction is too light, and that something more substantial is necessary. On this point I must differ with him, especially in reference to the dikes, which I regard as amply strong, and fully able to answer the purpose intended. In relation to the gates, it will be observed that the system suggested and estimated upon was not presented as final, but only as one of the many solutions of the problem. It was then intimated that although the problem was a complicated one, the difficulties involved were not of a nature to defeat the proposed improvement. If the system was applicable in other respects, no such obstacle would be permitted to stand in the way. Another system less objectionable might now be suggested, but it would be out of place in these remarks.

It may be proper here to call attention to the fact that the system of tidal basins designed by the late Major Twining, in connection with the improvement of the Washington Harbor, was indorsed by a board of engineers, and later by Major Hains, before a system of flushing gates had been decided upon.

I will not attempt to reply to objections raised as to the power of the proposed automatic apparatus to overcome the resistance and operate the gates at all times. Ample margin was allowed in the original calculation for the purpose of arriving at an ap-

proximate estimate of cost; but that is a matter of detail to be definitely settled at the proper time.

It is evident that the ice may interfere, at short intervals during the winter, with the regular operation of the gates proposed; but this can easily be overcome by removal of the moving slats, to be again replaced when the conditions are favorable. Such an operation would not require much labor or present serious difficulty, and as to the temporary suspension of the system of improvement, it cannot materially affect the efficiency of the channel. During the winter months the tides are low and the water usually clear, and any accumulated sediment would be rapidly removed as soon as the stored waters were properly directed into the channel. It may be proper in this connection to state that during the winter of 1881-'82, and the present winter to this date, there has not been one day in which the operation of the gates would have been interrupted by obstruction from the ice.

The possibility of an interruption in the operation of the gates arising from floating grass, weeds, and sticks has, I think, been overestimated. The water flowing through the gates proceeds from the main river, and will be comparatively free from such obstructions.

The present sectional area of the river on the line of the gates is 9,011 square feet, and that of the proposed channel 11,066 square feet, or an increase of about 23 per cent. This will bring a proportional decrease in the velocity of the flood current, and admitting, as has been stated, that an acceleration of the current will take place at the gates, and a proportional retardation below them, the sluggishly moving waters will not possess a scouring or sedimentary carrying capacity to produce the deposit now taking place. The injurious effect produced by the construction of the Long Bridge should not be presented as an illustration of what may be expected as the probable effect on the flats of the Branch if the proposed improvements were put into execution. At the Long Bridge no provision was made to compensate for the large reduction of sectional area involved in its construction, and the consequences have been such as might well be expected.

The depth of water on the flats of the Eastern Branch has been slightly reduced since 1842, but it is contemplated that with a reduced flood current and an acceleration of the ebb flow the depositing process will either be stopped altogether or reduced to such small limits as to cause no material reduction in the tidal prism, for an indefinite length of time. It is unquestionable that the material scoured and carried out on the ebb tide will be dropped again as soon as the velocity of the current is sufficiently reduced, but I do not admit that the deposition will be injurious to the flats below the gates. The scouring process will be dependent upon and increase or diminish with the ebb current. During three hours and fifty minutes of the ebb flow the current will have sufficient power to act on the material composing the bottom, and the confined waters, being thrown into the Washington channel, where the increased volume will cause a proportional increased acceleration, the material held in suspension will be carried down the main river to the sea, or be deposited on flats and in coves, where it can do no harm. As the velocity slackens, so will also its scouring power, and when it has been so much reduced as to be inoperative on the bed of the stream, it will yet be running with sufficient speed to carry forward into the main branch of the river the remaining material in suspension. When the waters cease to flow and the last of the ebb is spread over the flats at the mouth of the Branch, the water will be free of scoured sedimentary matter. In any event, the proposition that the flats may become too shoal to pass a sufficient amount of water over them, on the flood tide, to be of any use on ebb, and that as a consequence thereof the gates will become useless unless dredging is resorted to, is, I believe, totally inadmissible. No engineer in charge of the work should allow such a state of affairs to take place, and if, through lack of proper vigilance and foresight, sedimentary matter be permitted to accumulate as predicted, and bad comes to worse, he should not resort to dredging as a means of removing the deposited material, when a diversion of the ebb waters over the flats and through the gates would readily accomplish the desired result, without much expense, and in a comparatively short time. One or two ships anchored across the main channel would divert the water without any cost.

That the flats of the Eastern Branch may have to be reclaimed as a sanitary measure I will not admit or deny. What the remote future may bring to us is not at all easy to foresee, but I do claim that the proposed improvement will materially improve the present sanitary condition of the city, especially that portion adjoining the Anacostia River, and that the benefits derived therefrom will have fully justified any possible expenditure in connection therewith, before the reclamation of the flats is seriously considered.

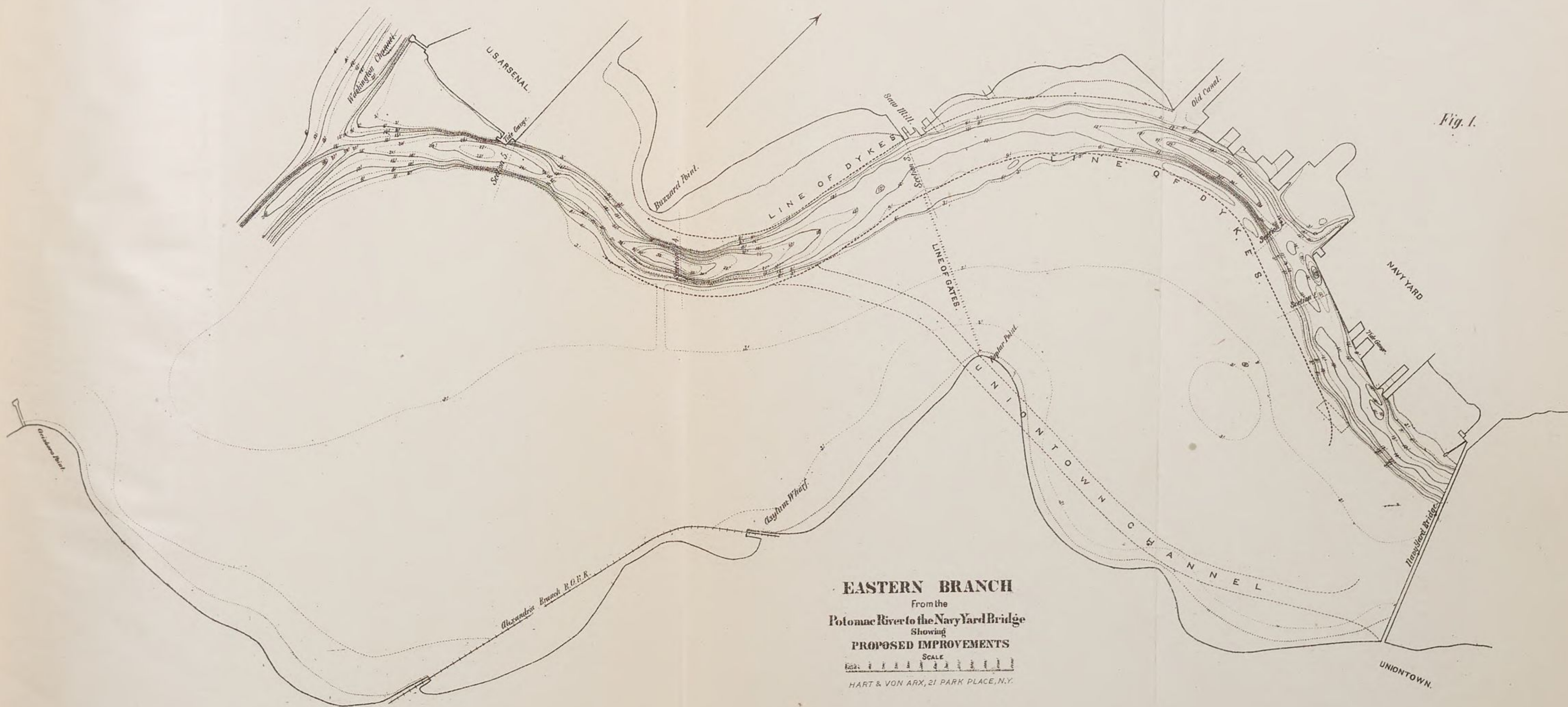


Fig. 2.

BLADENSBURGH

EASTERN BRANCH
FROM
POTOMAC TO BLADENSBURGH
SHOWING
TIDAL COMPARTMENT
AND
SCOURING BASIN.

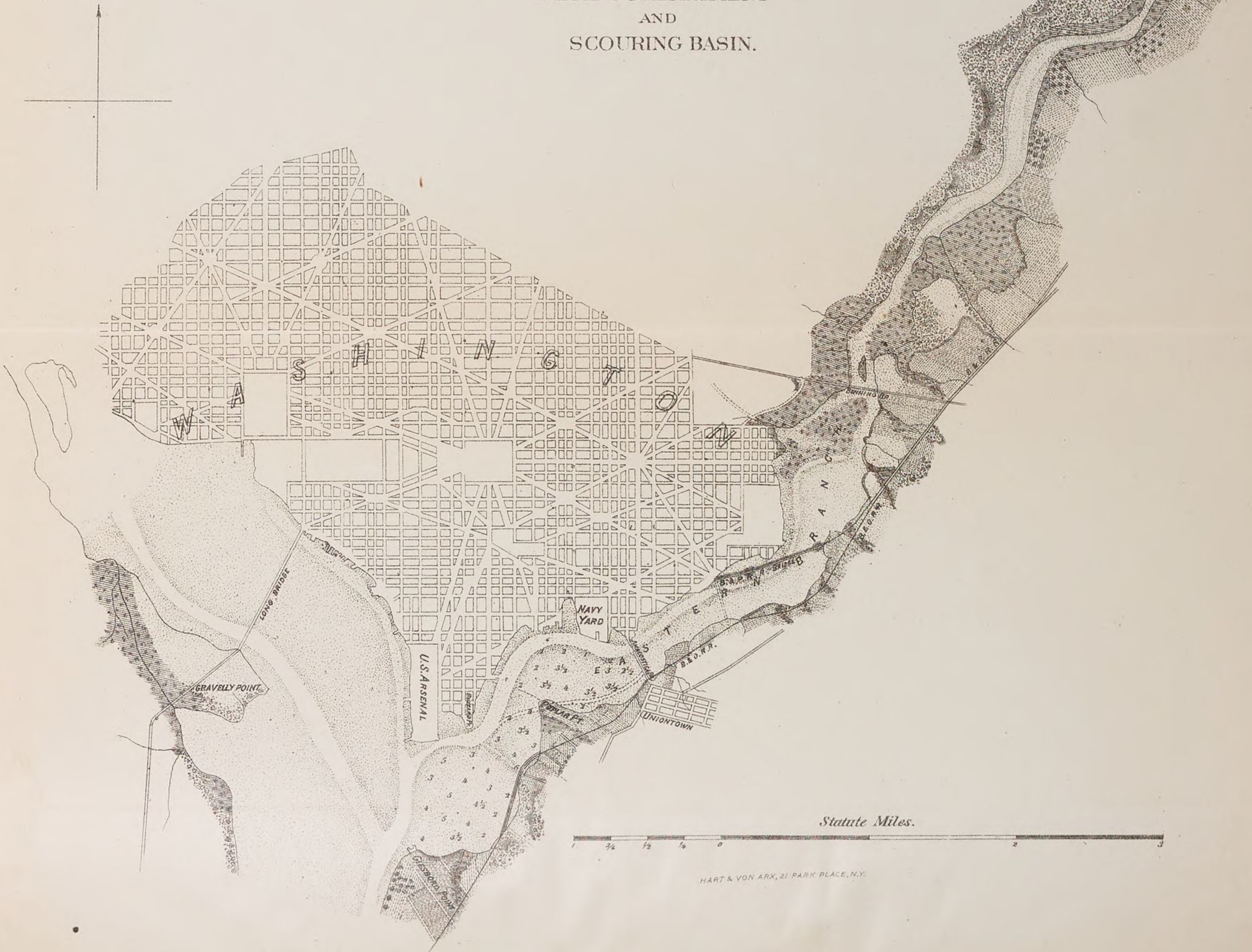
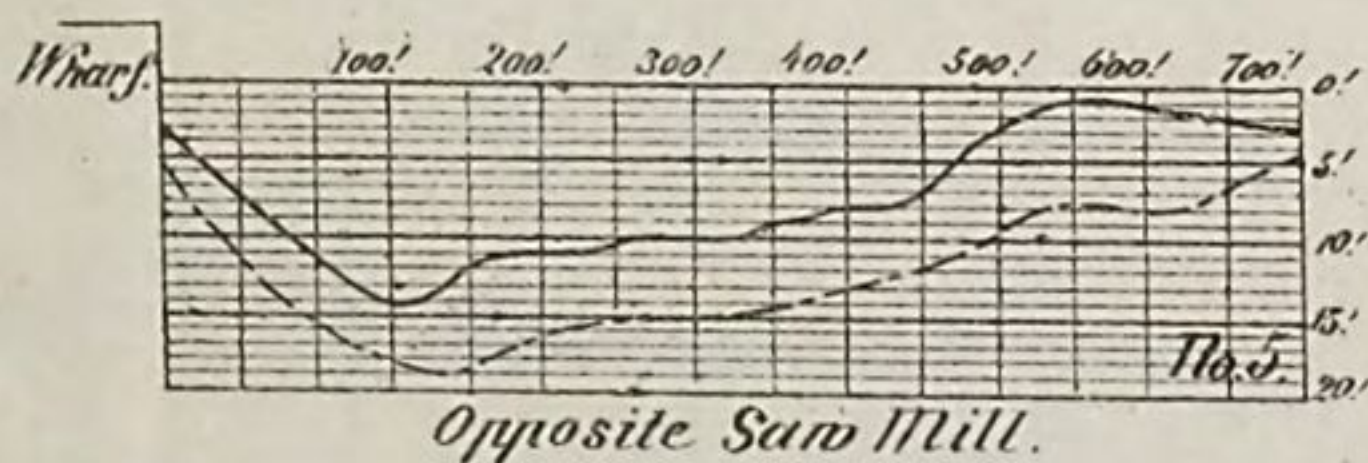
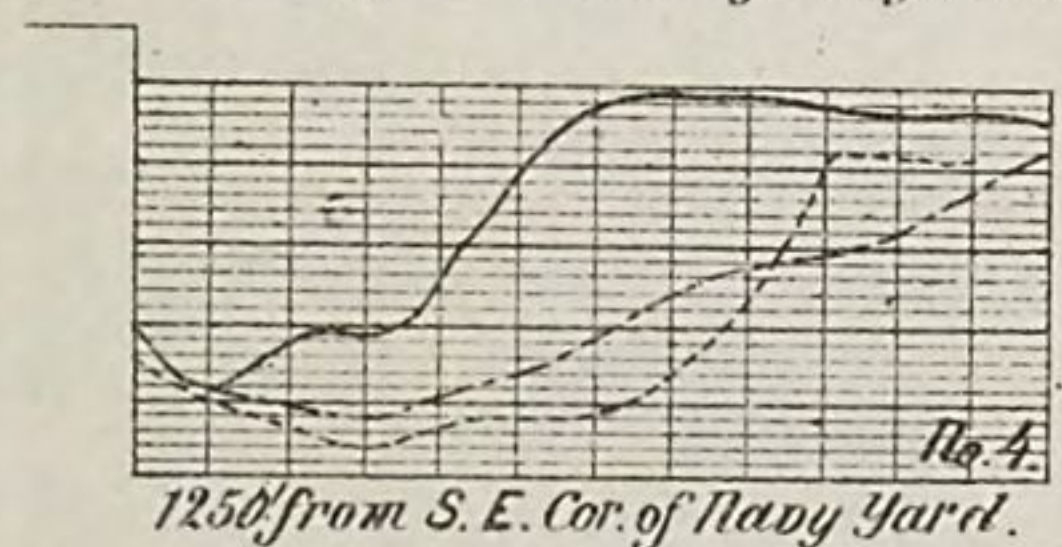
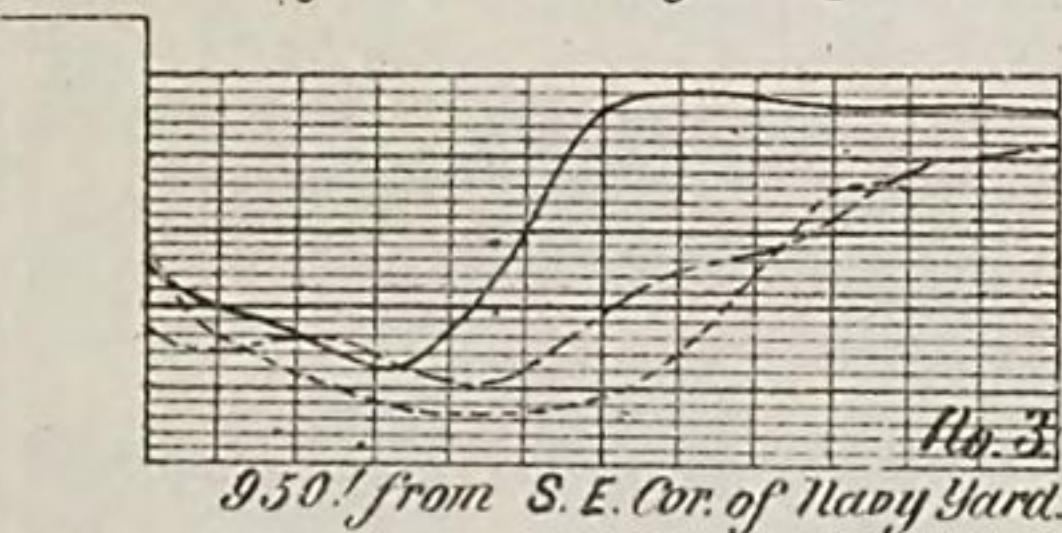
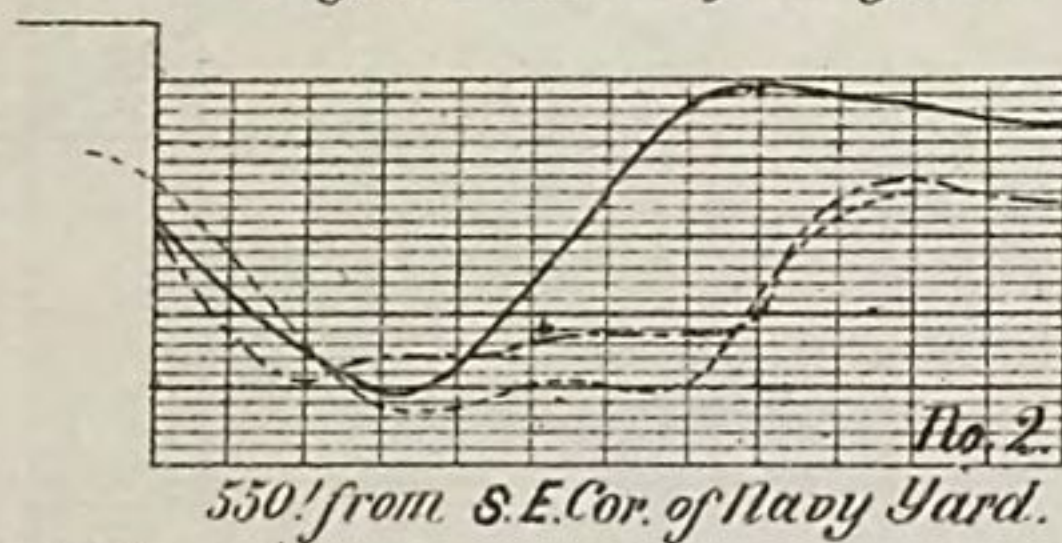
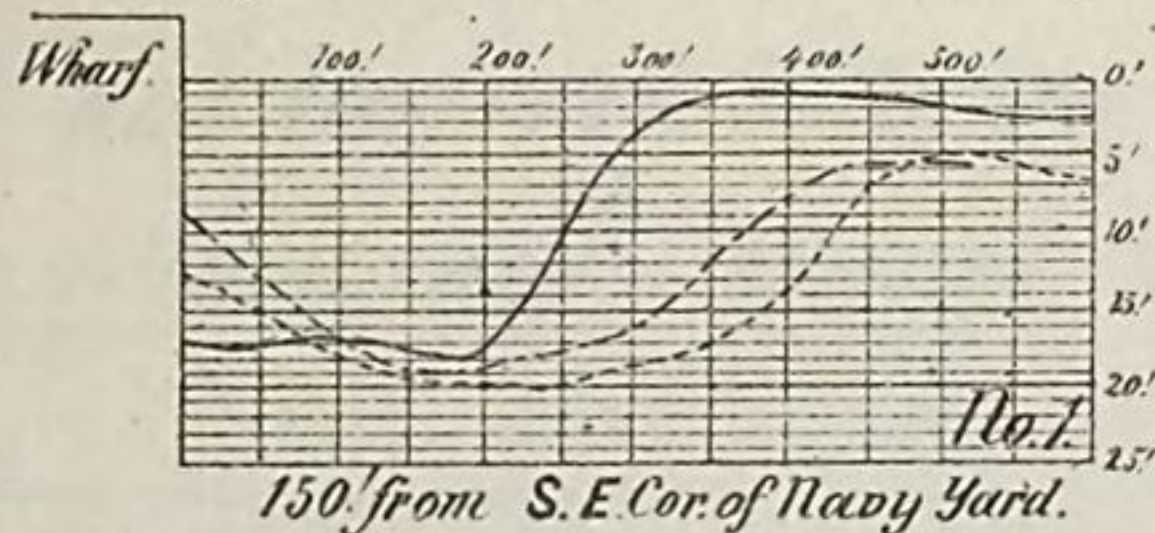


Plate 11

*Cross Sections of the Eastern Branch
Opposite the Navy Yard Washington.
plotted from Surveys of Yard Author-
itics in 1828. Coast Survey 1842 and
Survey 1882. (Mean low water.)*

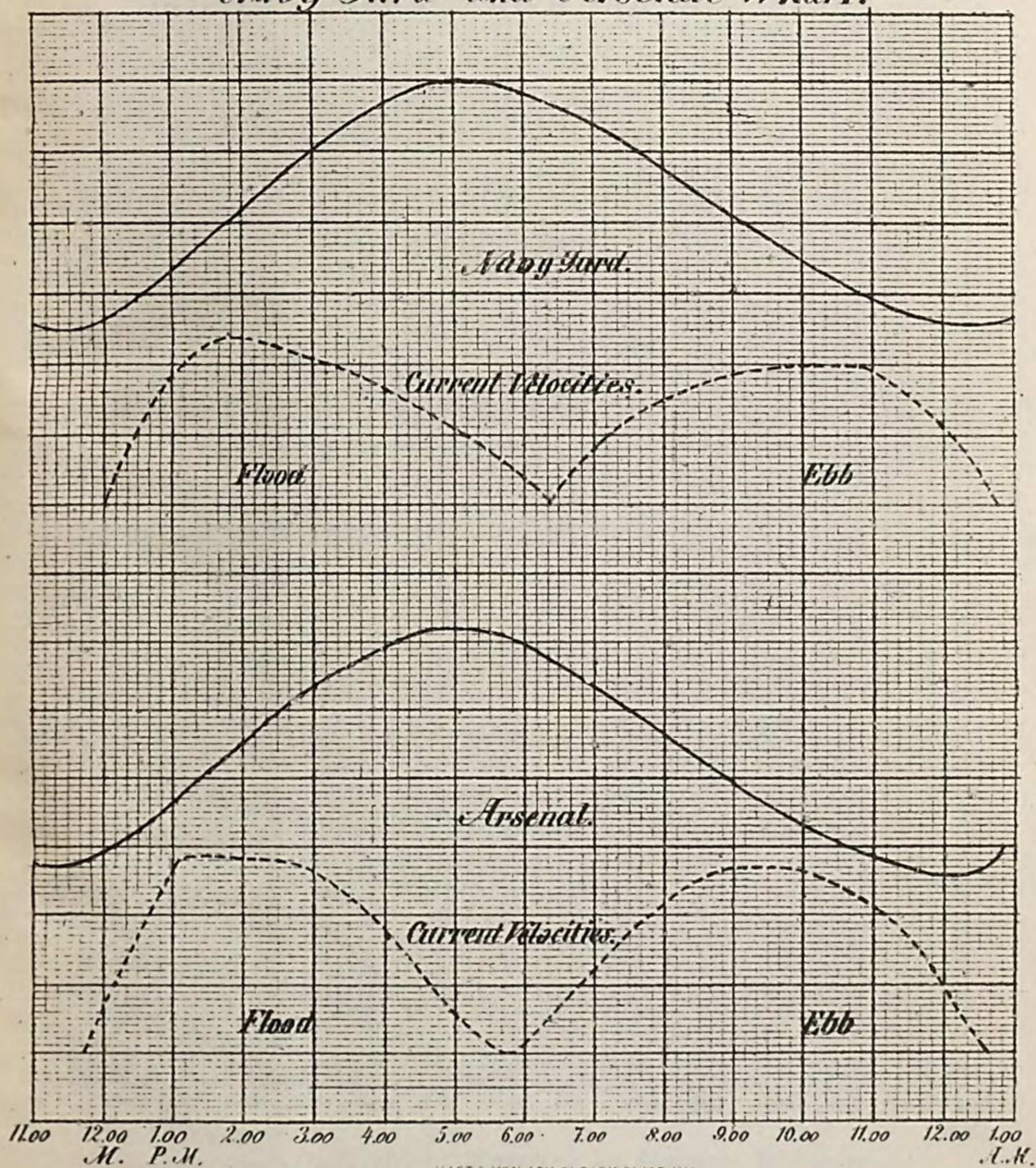


— Indicates Survey of 1882.
- - - " " " 1842.
- - - " " " 1828.

Cross in a width of 500'

	1828	1842	1882
Sec 1	7500	6410	4295
" 2	7385	6808	4477
" 3	7975	7227	4331
" 4	8340	7880	4090
" 5		8857	5276

Tide and Current Velocity Curves
of
Navy Yard and Arsenal Wharf. *Fig. 3.*



Life and Current Velocity Curves of Long Point and Vicinity, N. York

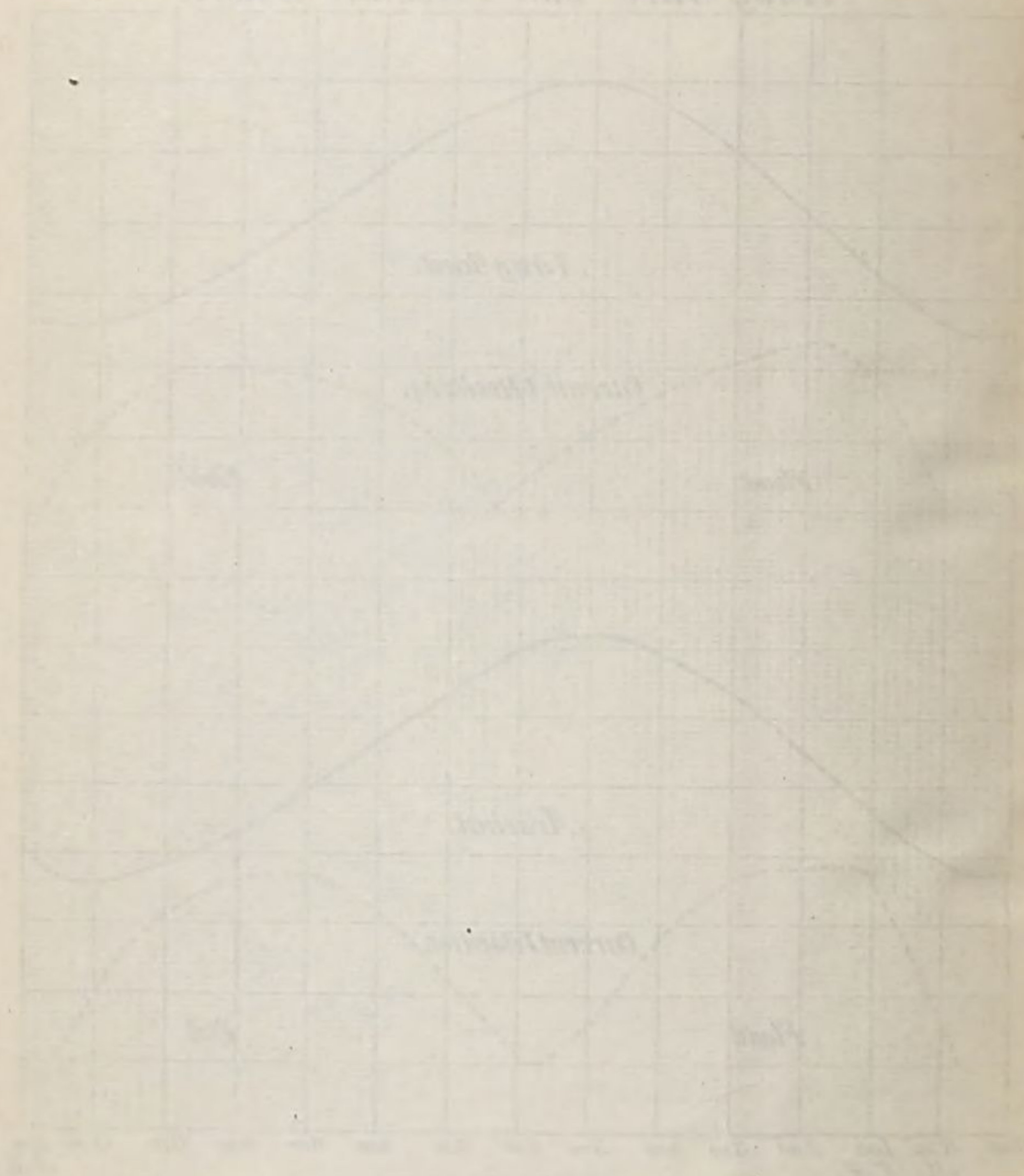
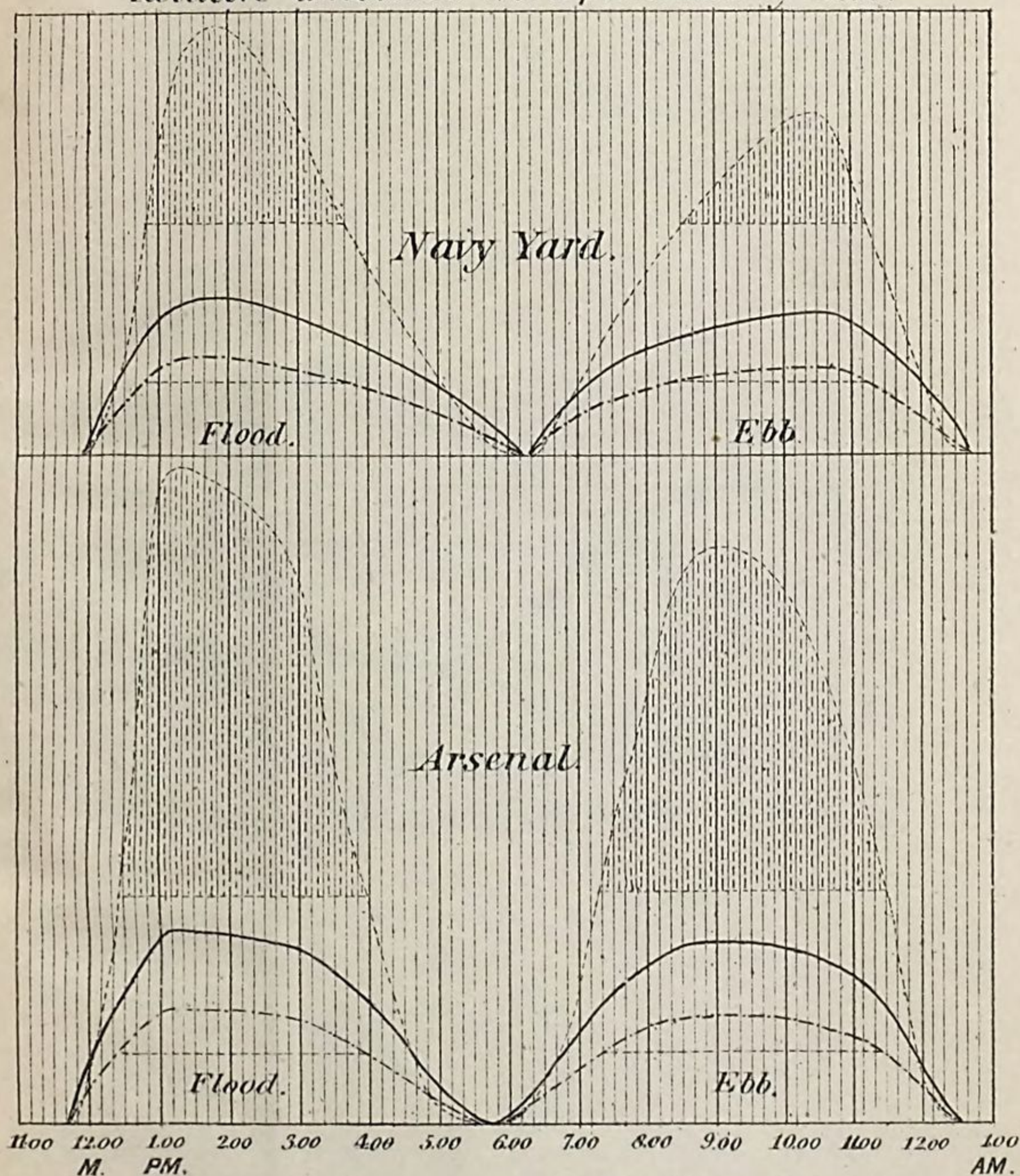


Fig. 4.

Velocity Curves and Areas.
showing
Relative amount of work performed by tides.



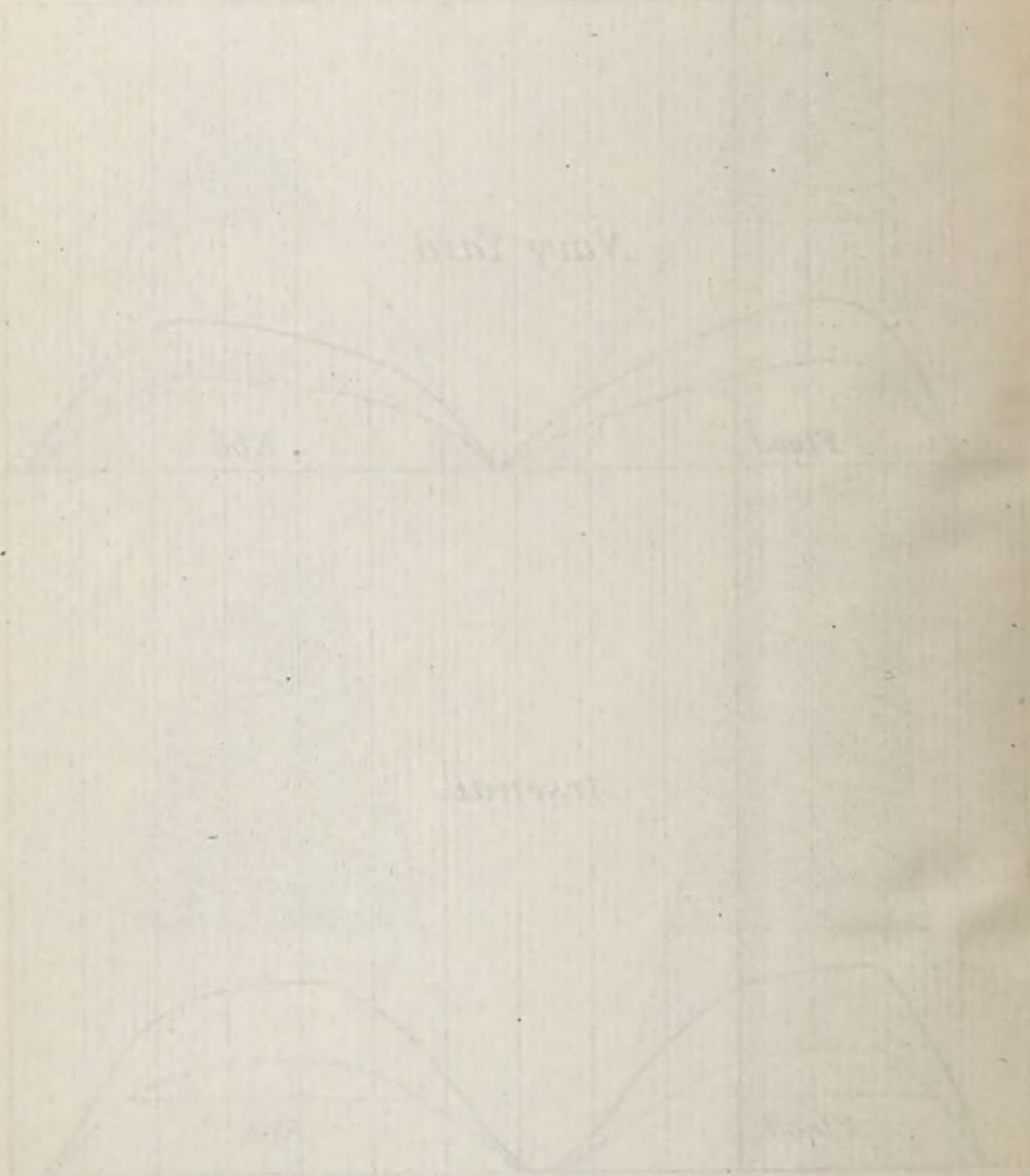
----- Indicates Square of Bottom Velocity.
 _____ " Surface Velocity.
 - . - . - . " Bottom "

Fig. 4.

Relative amount of water and steam

showing

the relative amount of water and steam



Relative amount of water and steam

showing

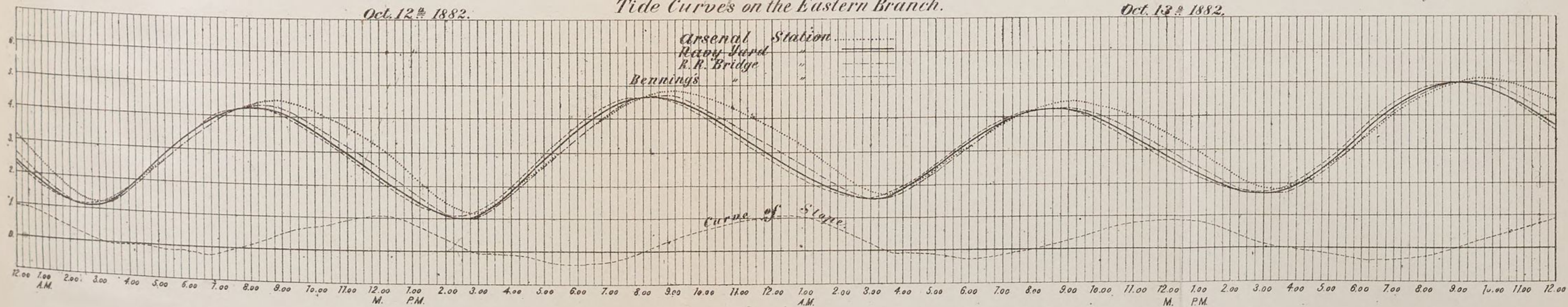
the relative amount of water and steam

Fig. 5.

Oct. 12th 1882.

Tide Curves on the Eastern Branch.

Oct. 13th 1882.



HART & VON ARX, 21 PARK PLACE, N.Y.

*Cross Sections
of
Present and Proposed Channel.*

Plate 6.

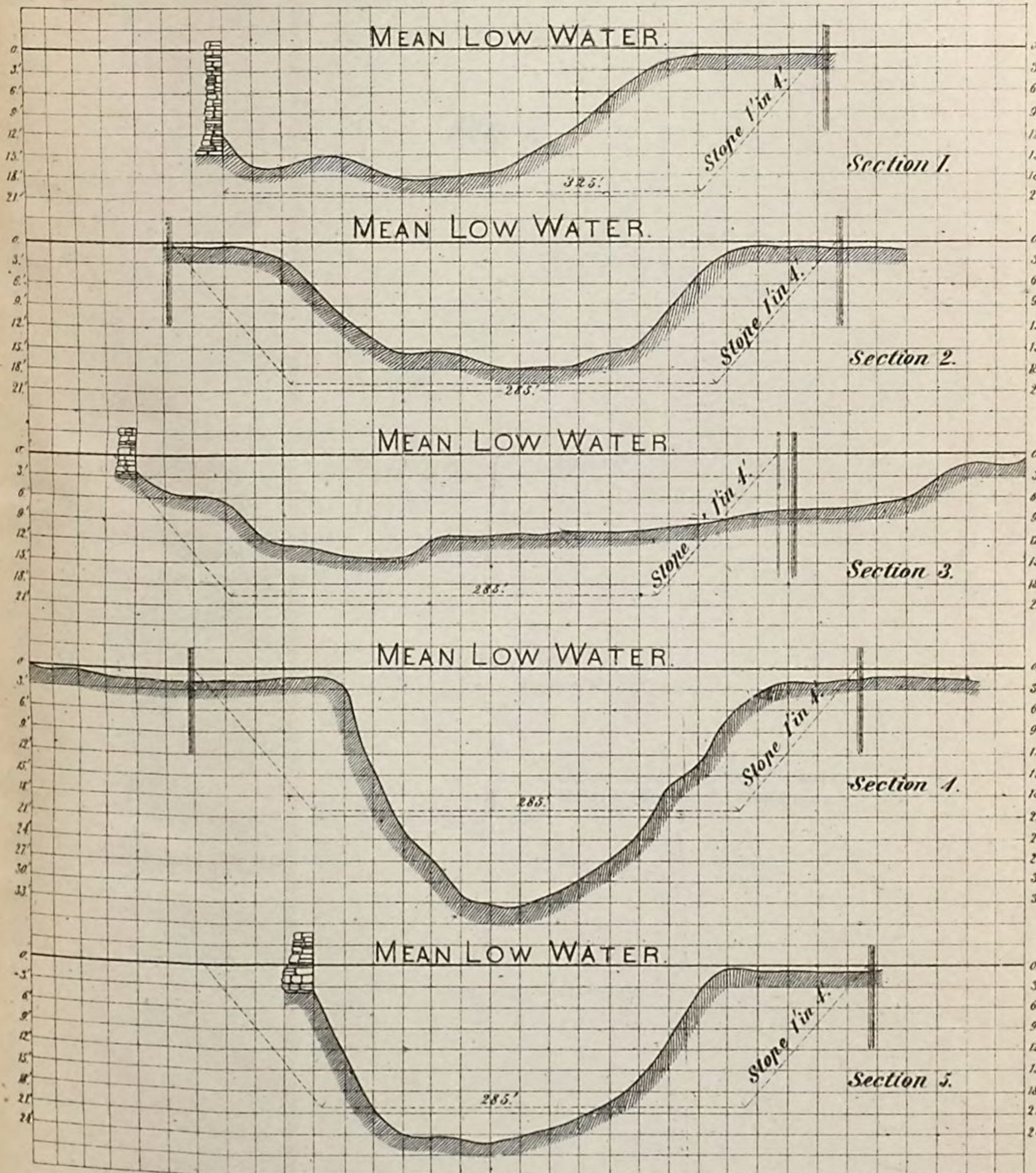


Chart of the
River and its Tributaries

MEAN LOW WATER

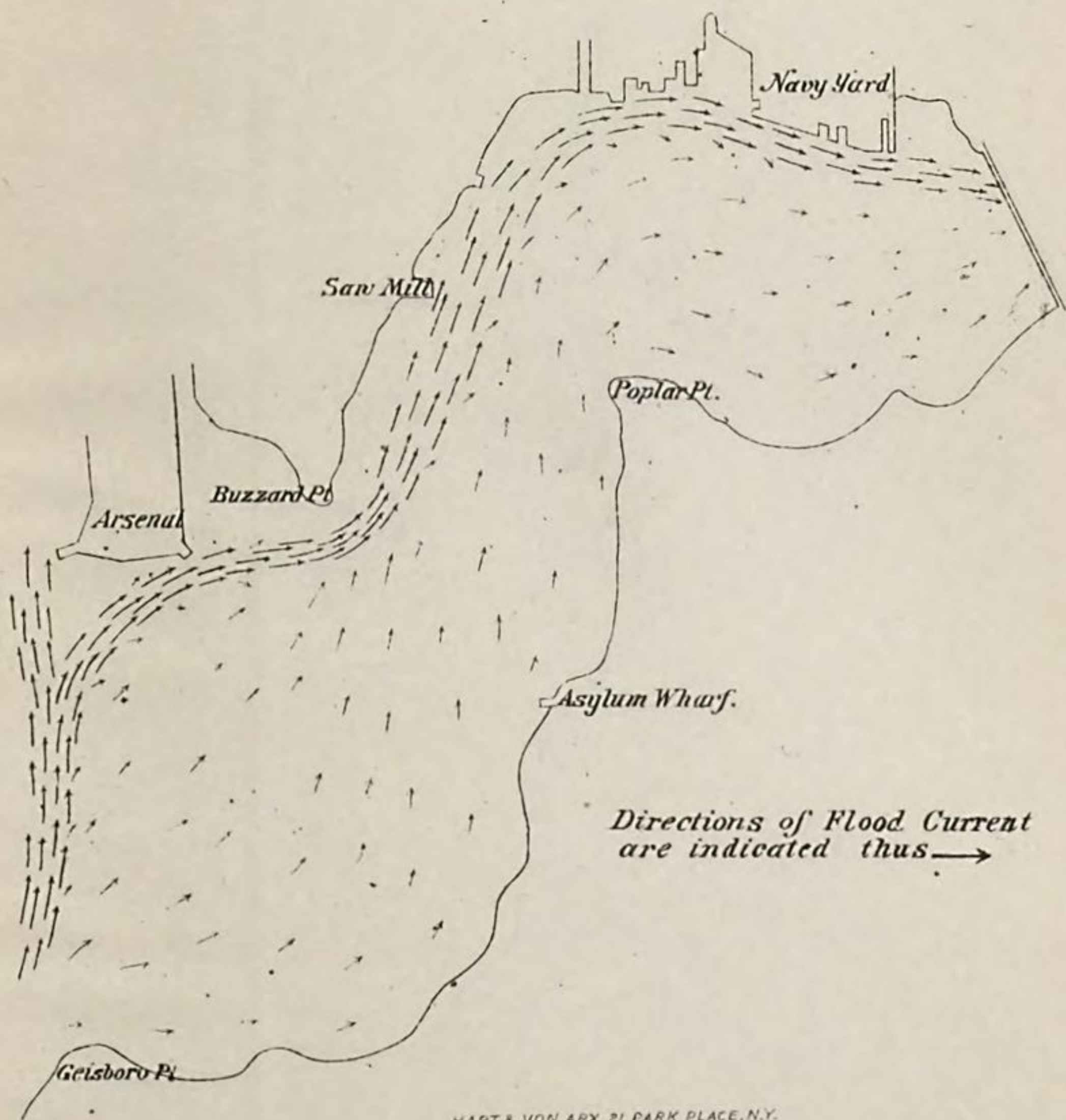
MEAN LOW WATER

MEAN LOW WATER

MEAN LOW WATER

MEAN LOW WATER

Fig. 7.



HART & VON ARX, 21 PARK PLACE, N.Y.

Fig 1

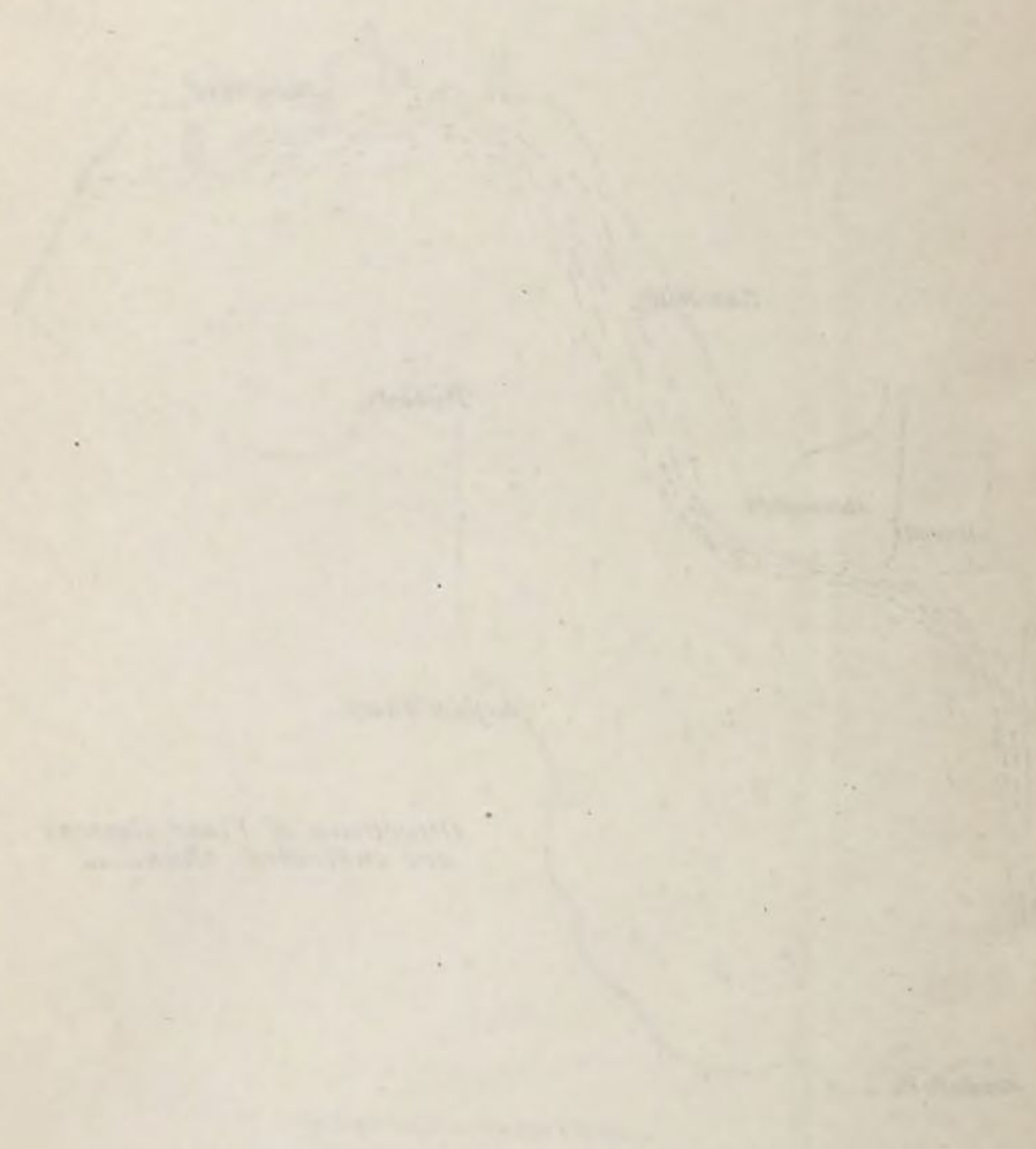
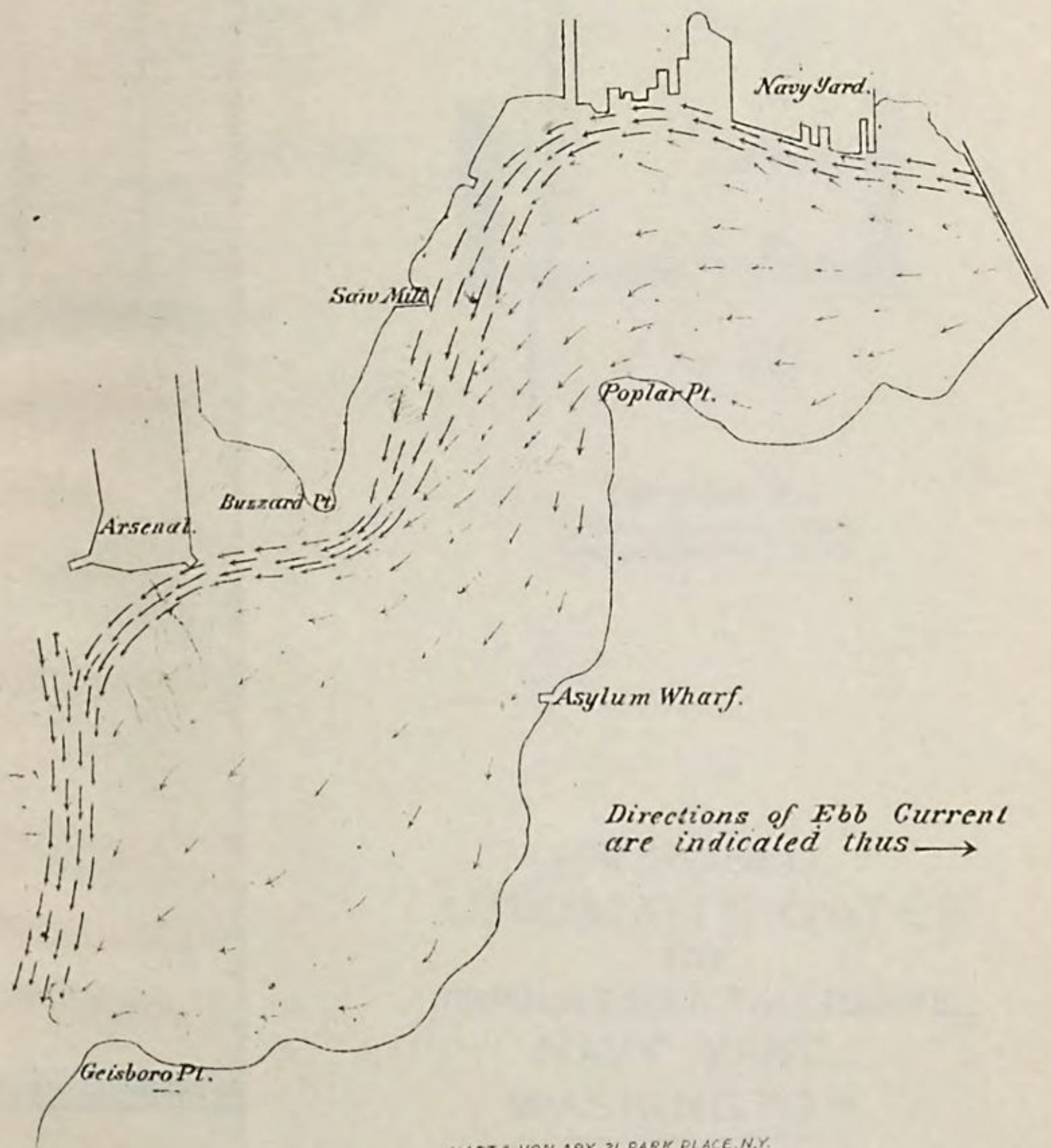
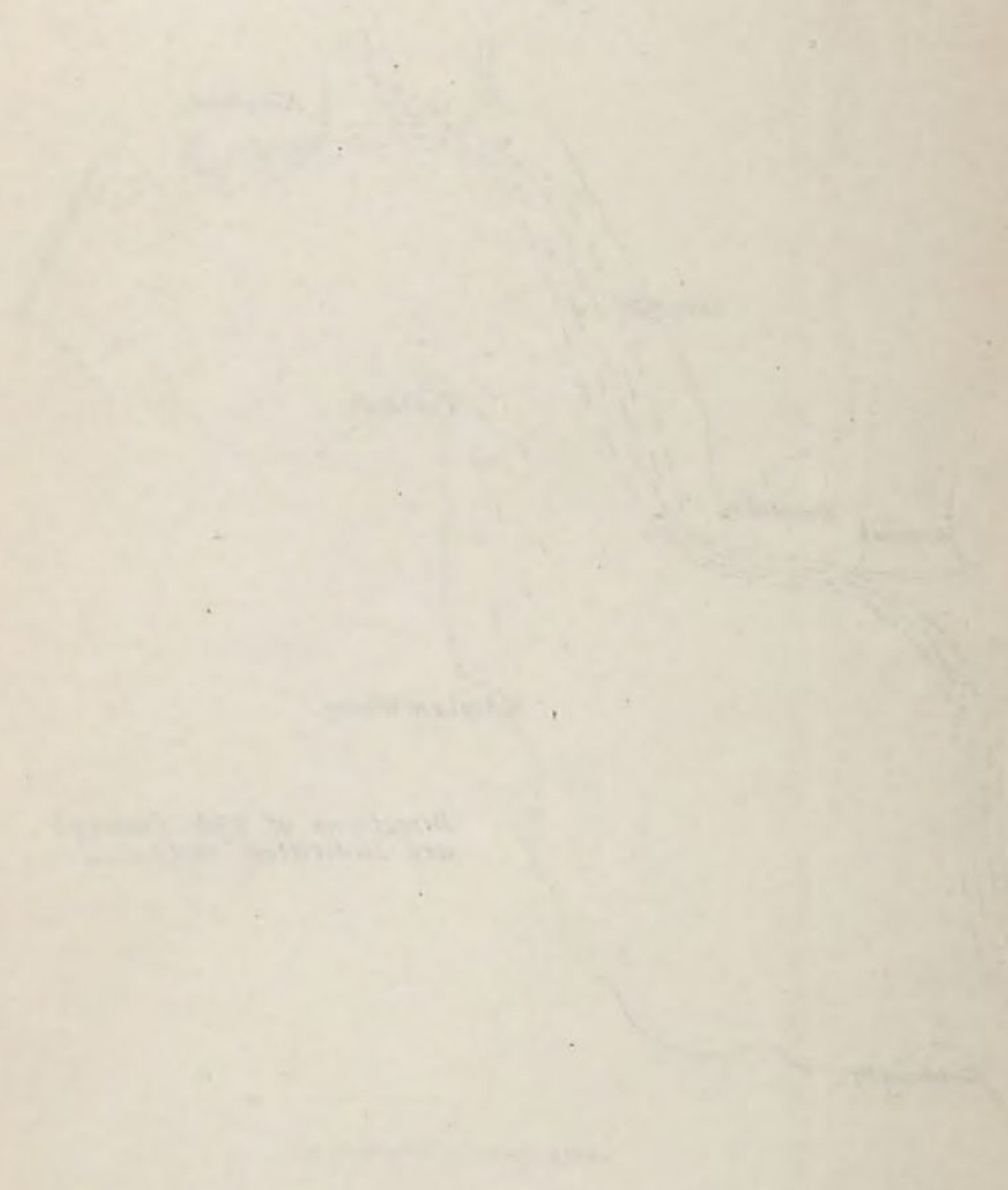


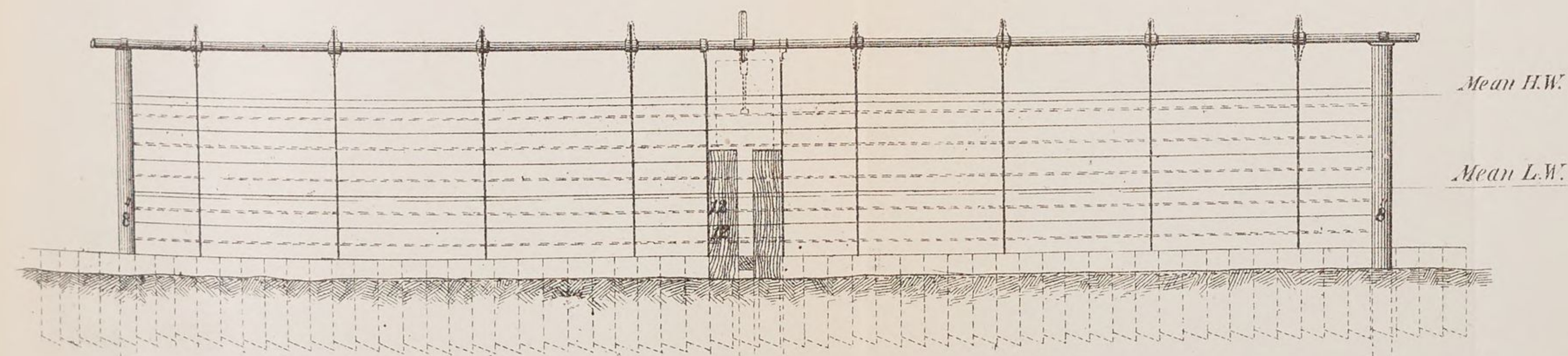
Fig. 8.



HART & VON ARX, 21 PARK PLACE, N.Y.

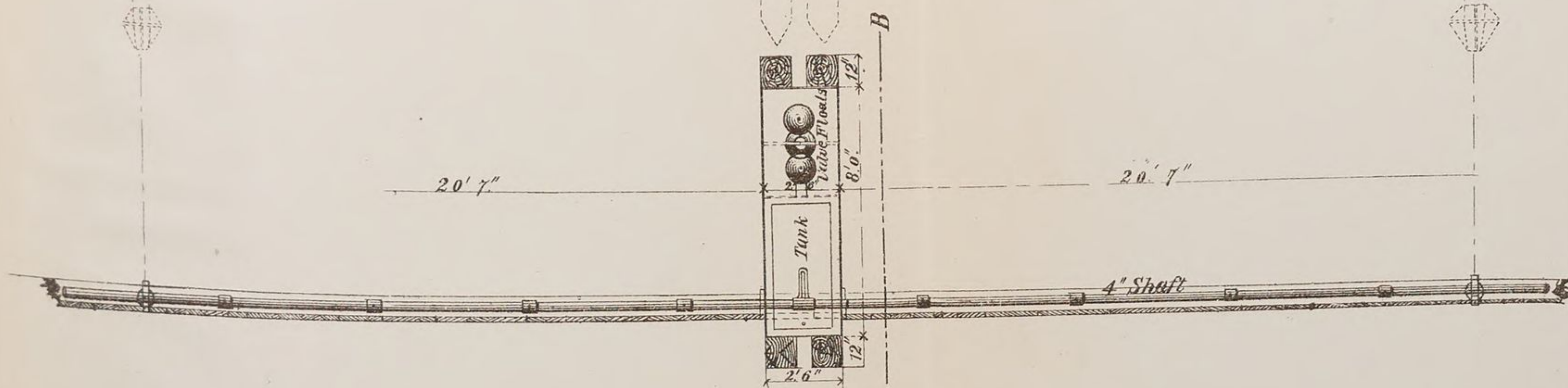
1874





ELEVATION OF ONE PAIR OF GATES.

Fig. 9.



TOP VIEW OF GATES.

HART & VON ARX, 21 PARK PLACE, N.Y.

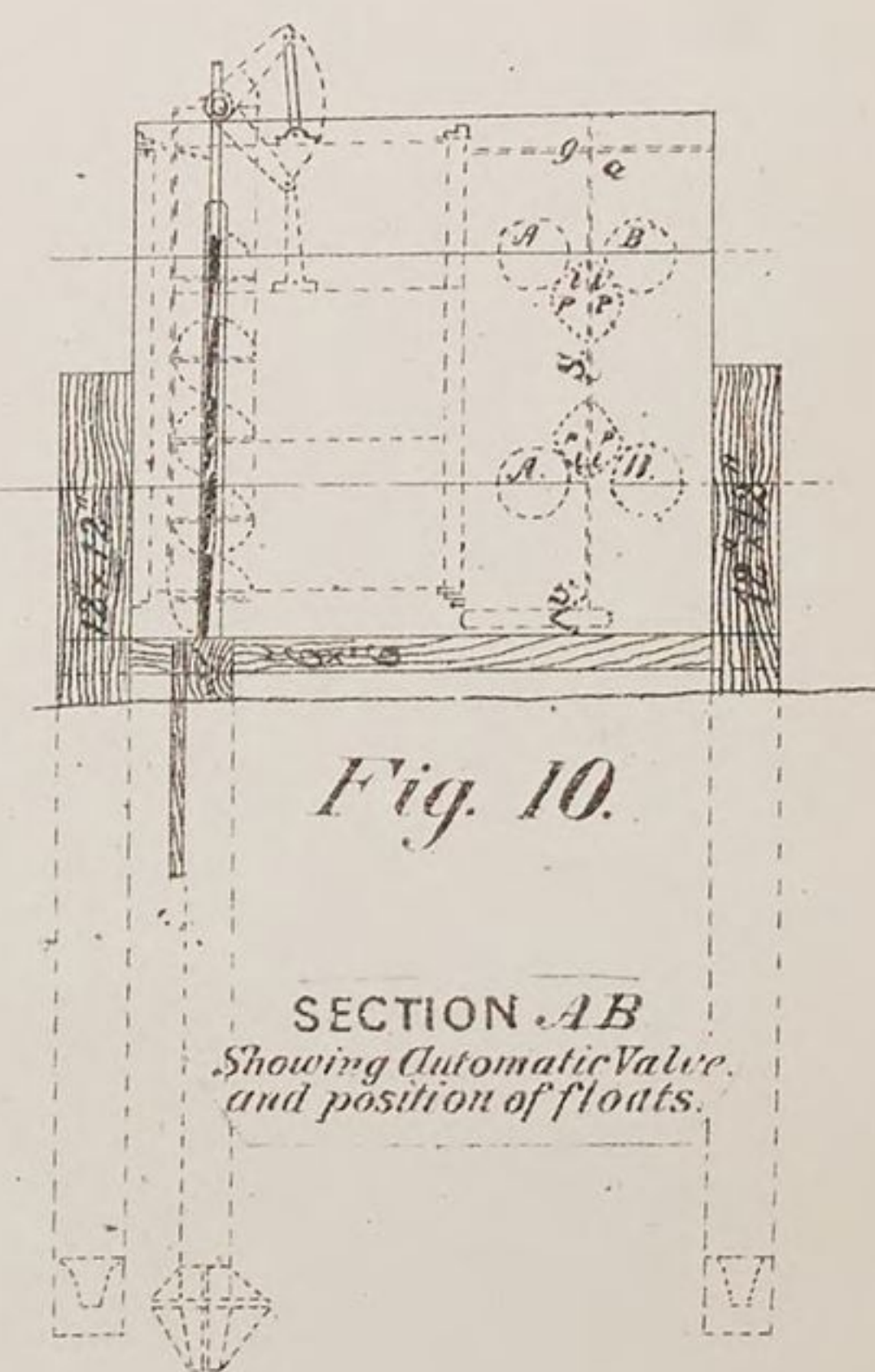


Fig. 10.

SECTION AB
Showing Automatic Valve
and position of floats.

PROPOSED
AUTOMATIC GATES
FOR
IMPROVEMENT OF CHANNEL
NAVY YARD
WASHINGTON

Scale $\frac{3}{16}'' = 1'$

Estimates of appropriations required for the service of the fiscal year ending June 30, 1885, by the Bureau of Yards and Docks, Navy Department.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
SALARIES.		
One chief clerk, per act March 3, 1883	\$1,800 00	
One draftsman and clerk, same act	1,800 00	
One clerk of class four, same act	1,800 00	
One clerk of class three, same act	1,600 00	
One clerk of class two, same act	1,400 00	
One clerk of class one, same act	1,200 00	
One clerk, \$1,000	1,000 00	
One messenger	720 00	
One laborer	660 00	
	11,980 00	\$11,980 00
Restoring clerk of class two to pay previously given (submitted)	200 00	
Restoring clerk of class one to pay previously given (submitted)	200 00	
Restoring clerk of \$1,000 to pay previously given (submitted)	200 00	
Restoring messenger to pay previously given (submitted)	120 00	
Restoring laborer to pay previously given (submitted)	60 00	
	780 00	
CONTINGENT.		
Stationery and miscellaneous items (submitted)	600 00	
	13,360 00	
GENERAL MAINTENANCE.		
For general maintenance of yards and docks, namely: For freight and transportation of materials and stores, books, models, maps, and drawings; purchase and repair of fire-engines; machinery; repairs on steam fire-engines, and attendance on the same; purchase and maintenance of oxen and horses, and driving teams, carts, and timber-wheels, and all vehicles for use in the navy-yards, and tools and repairs of same; dredging; postage on letters and other mailable matter on public service, and telegrams; furniture for government houses and offices in the navy-yards; coal and other fuel; candles, oil, and gas; cleaning and clearing up yards, and care of public buildings; attendance on fires, lights, fire-engines, and apparatus; for clerical and incidental labor at navy-yards; water-tax, and for tolls and ferriages; rent of officers' quarters at League Island; pay of watchmen in the navy-yards; and for awnings and packing boxes, and advertising for yards and docks purposes. 3d March, 1883 (submitted)	420,000 00	200,000 00
CONTINGENT.		
For contingent expenses that may arise at navy-yards and stations. 3d March, 1883	20,000 00	20,000 00
	440,000 00	220,000 00
NAVAL ASYLUM.		
One superintendent, per act March 3, 1883	\$600 00	
One steward, increased \$120 (submitted)	600 00	
One matron, increased \$120 (submitted)	480 00	
One chief-cook, increased \$120 (submitted)	360 00	
Two assistant cooks, increased \$72 each (submitted)	480 00	
One chief laundress, per act March 3, 1883	192 00	
Six laundresses, per act March 3, 1883	1,008 00	
Twelve scrubbers and waiters, increased three waiters, \$168 each (submitted)	2,016 00	
Six laborers, per act March 3, 1883	1,440 00	
One stable-keeper and driver, per act March 3, 1883	360 00	
One master-at-arms, increased \$120 (submitted)	600 00	
One house corporal, increased \$60 (submitted)	360 00	
One barber, per act March 3, 1883	360 00	
One carpenter, per act March 3, 1883	845 00	8,513 00
	9,701 00	

Estimates of appropriations required for Bureau of Yards and Docks, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
NAVAL ASYLUM—Continued.		
For water rent, per act March 3, 1883.....	\$2,000 00	
For cemetery, burial expenses, and headstones, per act March 3, 1883	350 00	
For improvement of grounds, per act March 3, 1883	500 00	
For repairs to buildings, furnaces, grates, ranges, furniture, and for furniture, per act March 3, 1883.....	4,500 00	
For car tickets, per act March 3, 1883.....	200 00	
For increase of library and rebinding books, per act March 3, 1883.....	300 00	
For music in chapel (submitted).....	600 00	
For erecting brick building in rear of main building for kitchen, per act March 3, 1883		
For laundry and servants' quarters, per act March 3, 1883	18,000 00	
For fitting up bath room with twelve tubs for beneficiaries' use, per act March 3, 1883.....	800 00	
	27,250 00	
For removing laundry boilers and tubs to new building, and plumbing, 3d March, 1883.....	400 00	
For kitchen range for new building, per act March 3, 1883.....	800 00	
	1,200 00	\$7,800 00
For support of beneficiaries, per act March 3, 1883.....	54,100 00	43,500 00
	92,251 00	59,813 00
REPAIRS AND PRESERVATION.		
For navy-yards and stations, per act March 3, 1883.....	400,000 00	200,000 00
FOR NAVY-YARDS AND STATIONS.		
Navy-yard, Portsmouth, N. H.:		
For water-works (submitted)	25,000 00	
	25,000 00	
Navy-yard, Boston, Mass.:		
For water-pipes (submitted)	25,000 00	
For cart-shed (submitted)	10,000 00	
For paving and grading (submitted)	20,000 00	
For floating-gate for dry-dock (submitted)	30,000 00	
For rebuilding wharves (submitted)	50,000 00	
	135,000 00	
Navy-yard, Brooklyn, N. Y.:		
For building for yards and docks for general storage (submitted)	85,000 00	
For boiler shop (wing to machine shop) (submitted).....	136,000 00	
For shipwright shed (submitted)	10,000 00	
For paint shop (submitted).....	20,000 00	
For dredging (submitted)	50,000 00	
For caisson for dry dock (submitted)	30,000 00	
For dredging, per act March 3, 1883		50,000 00
For cob-dock, per act March 3, 1883		50,000 00
	331,000 00	
Navy-yard, League Island, Pa.:		
For landing-wharf foot Fifteenth street (75 feet by 400 feet) (submitted)	26,000 00	
For dredging and filling in (submitted)	100,000 00	
	126,000 00	
Navy-yard, Washington, D. C.:		
For new ordnance machine shop (submitted)	95,000 00	
For extension of yard wall (submitted).....	21,000 00	
For dredging, continuation of (submitted)	25,000 00	
For dredging, per act March 3, 1883		15,000 00
	141,000 00	

Estimates of appropriations required for Bureau of Yards and Docks, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
FOR NAVY-YARDS AND STATIONS—Continued.		
Navy-yard, Norfolk, Va.:		
For two centrifugal cataraet pumps, including engine house (submitted) } pump well, culvert, and boiler (submitted)	\$45,000 00	
For extension of quay wall (submitted)	200,000 00	
For dry-dock extension (submitted)	200,000 00	
For railroad extension and engine house (submitted)	20,000 00	
For coal house No. 54 (submitted)	60,000 00	
For marine railway (submitted)	100,000 00	
	625,000 00	
Navy-yard, Mare Island, California:		
For continuation of dry-dock (submitted)	500,000 00	
For extension of timber-shed (submitted)	11,000 00	
For cisterns (submitted)	40,000 00	
For wharves, bridges, landings, and boats (submitted)	75,000 00	
For roads, walks, gutters, and drains (submitted)	20,000 00	
For artesian well (submitted)	10,000 00	
	656,000 00	
For dry-dock, per act March 3, 1883		\$275,000 00
Naval station, New London, Conn.:		
For quay wall (submitted)	150,000 00	
Naval station, Key West, Fla.:		
For bulkhead at water front (submitted)	4,500 00	
For purchase of Mallory lot (submitted)	15,000 00	
	19,500 00	
	2,208,500 00	390,000 00
CIVIL ESTABLISHMENT.		
Navy-yard, Portsmouth, N. H.:		
One clerk to civil engineer (submitted)	\$1,400 00	
One store clerk (submitted)	1,300 00	
One writer and assistant draftsman (submitted)	1,200 00	
One mail messenger (submitted)	700 00	
	4,600 00	
Navy-yard, Boston, Mass.:		
One clerk to civil engineer (submitted)	1,500 00	
One draftsman (submitted)	1,500 00	
One store clerk (submitted)	1,400 00	
One writer, commandant's office (submitted)	1,017 25	
One writer, civil engineer's office (submitted)	939 00	
One messenger and mail carrier (submitted)	900 00	
	7,256 25	
Navy-yard, Brooklyn, N. Y.:		
One draftsman (submitted)	1,500 00	
One clerk to civil engineer (submitted)	1,400 00	
One store clerk (submitted)	1,300 00	
One muster and time clerk (submitted)	1,200 00	
One writer (submitted)	1,000 00	
	6,400 00	
Navy-yard, League Island, Pa.:		
One chief clerk (submitted)	1,600 00	
One store clerk (submitted)	1,500 00	
One time clerk (submitted)	1,500 00	
One draftsman (submitted)	1,600 00	
One writer (submitted)	1,000 00	
One mail messenger (submitted)	700 00	
	7,900 00	

Estimates of appropriations required for Bureau of Yards and Docks, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
CIVIL ESTABLISHMENT—Continued.		
Navy-yard, Washington, D. C.:		
One chief clerk to civil engineer (submitted)	\$1,400 00	
One store clerk (submitted)	1,300 00	
One writer (submitted)	1,017 25	
	3,717 25	
Navy-yard, Norfolk, Va.:		
One clerk to civil engineer (submitted)	1,400 00	
One store clerk (submitted)	1,300 00	
One draftsman (submitted)	1,400 00	
One writer to civil engineer (submitted)	1,017 25	
One writer to commandant (submitted)	939 00	
One mail messenger (submitted)	600 00	
	6,656 25	
Navy-yard, Pensacola, Fla.:		
One clerk (submitted)	1,300 00	
One clerk (submitted)	1,200 00	
	2,500 00	
Navy-yard, Mare Island, California:		
One clerk to civil engineer (submitted)	1,500 00	
One store clerk (submitted)	1,400 00	
One writer (submitted)	1,200 00	
Do.....	1,200 00	
One draftsman (submitted)	1,600 00	
	6,900 00	
For navy-yards and stations (March 3, 1883)	45,929 75	\$24 000 00

No. 12.—BUREAU OF EQUIPMENT AND RECRUITING.

NAVY DEPARTMENT,
BUREAU OF EQUIPMENT AND RECRUITING,
Washington, October 29, 1883.

SIR: I have the honor to submit the following report of the operations of this Bureau during the past fiscal year, together with accompanying detailed estimates for the fiscal year ending June 30, 1885.

During the past year 74 vessels have been wholly or partially equipped under this Bureau, at an expenditure for labor, \$57,532.04, and for material, \$491,721.11; making a total, \$549,253.15.

For the present fiscal year Congress appropriated, under appropriation "Equipment of vessels," \$800,000, notwithstanding the Bureau's estimate of \$896,000, which was based upon the actual wants of the service. This sum is again asked for, under said appropriation, as actually necessary for the fitting out and keeping in repair the number of vessels contemplated to be retained in commission during the ensuing fiscal year.

The Bureau also submits, under appropriation "Increase of the Navy," an estimate for \$113,000, as being necessary to the completion of the monitors, the new cruisers, and the dispatch boat authorized by law and in process of construction.

COAL.

There have been purchased, at home and abroad, 44,977 tons of coal; costing, including freight and handling, \$346,533.08. In this connection I have to state that the contemplated establishment of a coaling station at Magdalena Bay, Lower California, has been abandoned, the Mexican Government having refused permission to land coal in that locality for the use of our cruisers. The present coaling station at Pichilingue will, therefore, have to be retained.

ROPE-WALK.

The following cordage has been manufactured:

	Pounds.
Manila rope	237, 030
Hemp rope	142, 450
Hide rope	3, 593
Wire rope	36, 196

Two small forming machines for wire cordage were also manufactured, and repairs made upon the engines, boilers, spreading and spinning machines, &c., by the machinists attached to the rope-walk.

There have been purchased 50 tons of Manila hemp, costing \$13,983.34, and $50\frac{1635}{2240}$ tons Russia hemp, costing \$9,892.33.

FORGE AND ANCHOR SHOP.

In this shop, in which the iron-rolling mill is located, a large quantity of chain and bar iron of various sizes, plate-iron for galleys, and blooms for equipment work has been turned out for this Bureau and the Bureaus of Construction and Repair and Steam Engineering.

In addition to the above, twelve "rollers," for bending boiler-plates, ranging in length from 17 to 18 feet and $15\frac{3}{4}$ inches diameter, were forged for the Bureau of Steam Engineering, as well as a number of forgings of different descriptions for the same Bureau and the Bureau of Ordnance.

The actual weights of iron manufactured in this shop during the year are—

	Pounds.
Chain-iron	63,984
Bar-iron	229,074
Angle-iron	1,151
Plate-iron	55,655
Hammered iron	4,660
Forgings	151,861
Blooms	85,000
Total	591,385

In this shop two scrap furnaces, in which bituminous coal was used with natural draft, have been changed to blast furnaces, and coke substituted for the coal. Previous to this change considerable difficulty was experienced in consequence of "red shortness," but since the use of coke a much better quality of iron has been obtained.

SMITH AND CHAIN SHOP.

Frequent experiments have been made in this shop during the year with low-grade steel of different qualities, to determine its welding properties, with a view to its use in the manufacture of chain cables.

Recent experiments with some steel procured from a manufacturer in Pittsburgh, Pa., have given the most satisfactory results. In a test of 12 triplets of this steel of $1\frac{1}{2}$ inch, 7 of them broke through the butt, bearing a strain nearly equal to the standard proof for $1\frac{3}{4}$ -inch iron, while the others gave way in the weld with a strain equal to the standard proof for iron of that size.

A steel cable of 30 fathoms, $1\frac{1}{2}$ -inch bar, is now being made for issue to some vessel in commission for practical test.

During the year about 1,800 fathoms of chain cable of various sizes, for general issue, besides numerous smaller articles, have been manufactured in this shop.

GALLEY SHOP.

There have been manufactured, during the year, one large range (double front), of Mr. Young's latest patent, which, after satisfactory trial on board the Vermont, has been placed on board the Trenton, and two of smaller size on the Wyandotte and United States Fish Commission steamer Albatross. In view of their many advantages over the galley now in use, the Bureau recommends and proposes their adoption for general use in the service, after further trial, which is believed will prove perfectly satisfactory.

Besides this work, several new and a number of old galleys have been made, altered, or repaired; also numerous other articles, consisting of stoves, cooking utensils, &c.

COASTERS' HARBOR ISLAND.

This island having been ceded to the Government, a regular station has been established there for the training of boys, under the command of Commodore S. B. Luce.

Congress appropriated for the current fiscal year, "For the continuation of the wharf for rigging and sail loft and for a drill-hall" on that island, \$45,000, in pursuance of which the Bureau has entered into contracts for the erection of a building for a rigging and sail loft and drill-hall, and for retaining walls, causeway for wharf, and for dredging.

These contracts have exhausted nearly the whole sum appropriated, leaving nothing for building the continuation of the wharf, and the Bureau is thus necessitated to ask in the estimates for the sum of \$35,000, as absolutely necessary for the completion of the wharf, for heating apparatus for the buildings, for a proper water supply for same and for repairs of the old causeway.

TRAINING SHIPS.

In this connection the Bureau would state that, although costly repairs have been made from time to time upon all the training ships in commission, they are still in bad condition, and require further and extensive repairs. In view of this fact, the Bureau would earnestly recommend that authority be asked from Congress to build in our navy-yards at least two wooden vessels for this service, of 900 tons capacity each.

The building of these vessels will only necessitate an appropriation for labor, as the Bureau is informed that there is plenty of material on hand which can be utilized for this purpose. On the score of economy it would be a wise and judicious measure to build these vessels, as the constant repairs necessary to the old training ships will be obviated, and the material now on hand, by using it for building new vessels, will be saved from deterioration and loss to the Government; besides, as soon as these vessels were completed, the old ones could be used to great advantage as stationary school ships for the training system.

ENLISTED MEN.

On the 30th of June, 1883, there were 6,640 enlisted men in the Navy, exclusive of boys, and during the past fiscal year 5,064 were enlisted to replace the deficiencies caused by death, desertion, and discharge.

I again renew and urge the recommendation of last year, that some special legislation be made by Congress with a view to supplying men for the Coast Survey, Fish Commission, and Naval Academy; thereby avoiding the frequent embarrassment in which the Bureau is placed when called upon to supply men for these branches of the governmental service, when the small force allowed the Navy may be needed for manning regular cruising vessels.

The conduct reports from the cruisers, with but few exceptions, continue to exhibit a marked improvement in the conduct of the enlisted men, and as a natural sequence the number of desertions is comparatively small.

NAVAL APPRENTICES.

At the close of the fiscal year there were 1,136 boys in the service, of which number 647 were serving on the training ships and 489 on board

of nineteen cruising vessels, being distributed among the several squadrons as follows :

On the North Atlantic Station.....	180
On the South Atlantic Station.....	73
On the European Station.....	70
On the Pacific Station.....	59
On the Asiatic Station.....	107

The training ship New Hampshire, stationed at the headquarters, Coasters' Harbor Island, is employed in preparing the boys for the more advanced instruction and exercise on board of the cruising training ships Saratoga, Portsmouth, and Jamestown.

When sufficiently qualified for the general service, the boys are transferred to the regular cruising vessels of the Navy, where they remain until they become twenty-one years of age.

The Minnesota, at New York, has been employed more particularly as a recruiting ship, with very gratifying results, having enlisted 596 boys, or more than 72 per cent. of the entire number received during the year, viz, 824. Of 3,275 applicants for enlistment, 1,937, or about 59 per cent., were rejected on account of physical or other disqualifications; 1,388, or about 41 per cent., being accepted as qualified for the service. Of the latter number, about 62 per cent. were enlisted, the rest having failed to secure the consent of their parents or guardians, or failed to satisfy the recruiting officers as to character, &c., and only about 25 per cent. of the total number of applicants were actually enlisted in the service, which is about the customary ratio.

The reports of commanding officers regarding the apprentices under their command show commendable progress in the training of the boys, and in the system adopted. Punishments have not been necessary to any great extent, owing to the fact that a better and more intelligent class of boys has been obtained.

Applications are constantly being received from the commanding officers of cruising ships for an increase of the complement of apprentices on board their vessels, and the Bureau earnestly recommends that application be made for such modification of the law as will authorize the enlistment of at least one thousand boys annually, which number can be readily absorbed by the regular cruisers. During the year, 176 apprentices have been discharged with honorable "continuous-service certificates," by reason of expiration of sevice, of which number 97 have received "certificates of commendation."

The regulations provide that apprentices who attain a certain degree of proficiency and are unexceptionable in conduct may, after re-enlistment for three years, be assigned to a class for more advanced instruction as seamen gunners. A number of them are now serving in that rating, and one has been appointed an acting gunner, under the provisions of section 1417, Revised Statutes of the United States, as amended May 12, 1879.

From present experience the Bureau is perfectly satisfied that the time is not far distant when the service will be amply supplied with a class of young and intelligent sailors who will be a pride to the nation, and should the emergency arise will prove themselves an honor to the country.

Respectfully submitted.

Your obedient servant,

EARL ENGLISH,
Chief of Bureau.

Hon. W. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Equipment and Recruiting.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be re- quired for each detailed object of expenditure.	Amount appropri- ated for the cur- rent fiscal year ending June 30, 1884.
SALARIES.		
Chief clerk (March 3, 1883, 22, Stat., p. 554, sec. 1; R. S., p. 70, sec. 416)	\$1, 800 00	.....
One clerk of class 4 (March 3, 1883, 22 Stat., p. 554, sec. 1; R. S., p. 27, sec. 167)	1, 800 00	.....
One clerk of class 3 (same acts)	1, 600 00	.....
Two clerks of class 2 (same acts)	2, 800 00	.....
Three clerks of class 1 (same acts)	3, 600 00	.....
Two copyists (same acts)	1, 800 00	.....
One assistant messenger (same acts)	720 00	.....
One laborer (same acts)	660 00	.....
	14, 780 00	\$14, 780 00
CONTINGENT EXPENSES.		
Stationery, books, and miscellaneous items (appropriated 22 Stats., p. 554, sec. 1)	500 00	.....
EQUIPMENT OF VESSELS.		
Coal for steamers' and ships' use, including expenses of transportation, storage, and handling; hemp, wire, hides, and other materials for the manufacture of rope and cordage; iron for the manufacture of anchors, cables, galleys, and chains; canvas for the manufacture of sails, awn- ings, bags, and hammocks; heating apparatus for receiving-ships; and for the purchase of all other articles of equipment at home and abroad, and for the pay of labor in equipping vessels, and manufacture of equip- ment articles in the several navy-yards (appropriated, 22 Stat., p. 475, sec. 1; R. S., p. 733, secs. 3709, 3747)	896, 000 00	800, 000 00
TRANSPORTATION AND RECRUITING.		
For expenses of recruiting for the naval service, rent of rendezvous, and expenses of maintaining the same, advertising for men and boys, and for the transportation of enlisted men and boys, at home and abroad (appro- priated, 22 Stat., p. 475, sec. 1; R. S., p. 721, sec. 3666)	25, 000 00	25, 000 00
CONTINGENT.		
For extra expenses of training-ships, freight and transportation of equip- ment-stores, printing, advertising, telegraphing, books and models, post- age, car-tickets, ferriage, ice, apprehension of deserters and stragglers, certificates and good-conduct badges for enlisted men, school-books for training-ships, medals for boys, and emergencies arising under cogni- zance of the Bureau of Equipment and Recruiting, unforeseen and impos- sible to classify (appropriated, 22 Stat., p. 475, sec. 1; R. S., p. 721, sec. 3666)	10, 000 00	10, 000 00
CIVIL ESTABLISHMENT.		
Navy-yard, Kittery, Me.:		
One clerk	\$1, 300 00	
Navy-yard, Charlestown, Mass.:		
One superintendent of rope-walk	1, 800 00	
One clerk	1, 400 00	
One clerk	1, 300 00	
One writer	1, 017 25	
Navy-yard, Brooklyn, N. Y.:		
One clerk	1, 400 00	
One clerk	1, 300 00	
Navy-yard, League Island, Pa.:		
One clerk (March 3, 1883, 22 Stat., p. 475, sec. 1)	1, 300 00	
Navy-yard, Washington, D. C.:		
One clerk	1, 400 00	
One clerk	1, 300 00	
One writer	1, 017 25	
Navy-yard, Norfolk, Va.:		
One clerk	1, 300 00	
Navy-yard, Pensacola, Fla.:		
One writer	1, 017 25	
Navy-yard, Mare Island, California:		
One clerk	1, 400 00	
	18, 251 75	\$9, 000 00

Estimates for appropriations required for the service of the fiscal year, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
NAVAL TRAINING STATION, COASTERS' HARBOR ISLAND.		
For completion of wharf and dredging, heating apparatus and water supply for drill hall and training ships, and for repair of old building and main causeway (March 3, 1883, 22 Stat., p. 620, sec. 1)	\$35,000 00	\$45,000 00
INCREASE OF THE NAVY.		
For completing equipment outfits of (3) three new cruisers, (1) one dispatch boat, and monitors, now in course of construction (March 3, 1883, 22 Stat., p. 477, sec. 1)		113,000 00

No. 13.—BUREAU OF NAVIGATION.

NAVY DEPARTMENT, BUREAU OF NAVIGATION,
November 1, 1883.

SIR: I have the honor to submit the following report of the Bureau of Navigation for the past year, together with the estimates for its support, and for the expenditures that will probably be necessary for the fiscal year ending June 30, 1885.

Included in this report, and transmitted herewith, are the reports and estimates of the several offices under its control.

NAVIGATION.

Compasses.—The form of compass hitherto in use required frequent repairs, and after being submitted to a series of tests, has been found to have insufficient directive force and sensibility. A new form of float has been adopted, a sapphire cap has been substituted for one of agate, the number of needles has been increased to four, and the compass, as modified, will have greater directive force and increased sensibility. To insure the best compasses only being received, all of their parts are sent to the Bureau for inspection. If after a thorough examination, which extends to the measurement of the magnetic strength of each needle, the various parts prove satisfactory, they are returned to the makers to be put together.

In order to prepare naval officers generally for the transition from wooden to iron and steel ships, and to aid the inquiry into the subject of the magnetism of ships, new forms for reports of compass deviations have been substituted for those formerly in use. From the commanding officers of many of the vessels in commission satisfactory observations have been received.

The reasons given last year for the erection of a suitable building in which to test the compasses for the use of the Navy have additional force because of the construction of the four steel cruisers and the completion of the five monitors authorized by Congress. A complete set of instruments for its equipment will soon be in possession of the Bureau, and I have therefore submitted an estimate for the construction of a simple and inexpensive structure of non-magnetic materials.

Determination of longitudes.—The results of the observations made by naval officers under Commander F. M. Green for the telegraphic determination of longitudes at various points from Vladivostok to Madras, referred to in my last report, have been published and distributed to various scientific institutions and societies, and to individuals interested in the subject.

To complete the measurement of differences of longitudes over existing ocean cable lines, a party of naval officers under Lieut. Commander C. H. Davis has determined the longitudes of Galveston, Tex., and

Vera Cruz, Mexico, and are now engaged in establishing positions on the Pacific coast, south of Panama.

Navigation supplies.—The steamer Trenton has been lighted throughout with electricity. The electric plant consists of an Armington-Sims high-speed engine, an L dynamo, an automatic regulator, and the necessary "leads" and safety appliances for 250 incandescent lamps, supplied by the "Edison Company for Isolated Lighting." As the Trenton is the first United States naval vessel lighted by electricity, her commanding officer has been directed to report in detail upon the practical effects of the routine work of a ship of war upon this system of lighting, and upon its efficiency and cost in comparison with other methods.

With the view of reducing the expenses of the Bureau in order not to exceed the amount appropriated, mineral oil has been adopted for illuminating purposes in the receiving and stationary ships.

Additional books have been supplied to the libraries of cruising vessels; and in this connection I beg leave to urge the necessity for the limited appropriation for which I have asked, in order to publish in convenient form such information obtained from leading professional periodicals and from other sources as will be of value to naval officers, to the Merchant Marine and to the shipbuilding interests of the country. It is only by republishing extracts from the large number of periodicals devoted to professional matters that a knowledge of the changes constantly going on in the naval profession can be supplied to our vessels of war.

In consequence of the small annual appropriation for the purchase of navigation stores, and the necessity for making purchases of small quantities frequently, it has been found almost impracticable to advertise for proposals. When, however, purchases have been made in open market, bids have been invited from reputable firms dealing in the supplies required, and the lowest has invariably been accepted.

Through the courtesy of the Light-House Board, illuminating oils, which constitute the largest item in the expenditures under this Bureau, are obtained at contract prices from the Light-House Establishment, which advertises annually for proposals. In consequence of the large quantities of oils purchased by the Light-House Board, and the careful inspection and rigid tests applied to them, our vessels are not only supplied with better qualities of oils, but at lower prices than could otherwise be obtained.

Library.—During the past year the books in the Department library have been rearranged, new books have been added as far as practicable, and a catalogue has been nearly completed. As the library for many years received little besides public documents and odd volumes from ships' libraries, many of them duplicates, it has been impossible to do more than make a beginning. The need of a suitable working library for the Department is so great, and the inconvenience of being without it is so serious, that an appropriation of \$5,000 is recommended, to purchase indispensable professional books.

I would renew the recommendation made in my last annual report, that the restrictions now imposed upon the binding of books for the library be removed, and that it be placed, in this respect, on the same footing as the library of the Department of State. I would also recommend that the library should be authorized to exchange its duplicates.

Regulations for preventing collisions at sea.—I desire to renew the suggestion made in former reports, that Congress be requested to adopt the Revised International Regulations for preventing collisions at sea, and thus do away with the confusion which now exists, in consequence of the

differences between the regulations adopted by all other maritime nations and the laws of the United States, and which is likely to cause loss of life and property.

In connection with the rules for preventing collisions at sea, I desire to again call attention to the importance of modifying (so far as inland navigation is concerned) Rules 17 and 20 for preventing collisions on water, chapter 5, page 818, Revised Statutes of the United States, second edition, 1878.

These rules give vessels of shallow draught propelled by sails the right to hold their course in the narrow channels of our bays and rivers, which in many instances have been deepened at great expense; and require steamers of the heaviest draught and largest size to keep out of the way. To comply with these rules is often impracticable, and the attempt to do so results in collision or in the grounding of the deeper draught vessel; in either case causing delay and loss to owners and underwriters.

I would respectfully recommend such modifications to Rules 17 and 20 as will insure in deep and narrow channels the right of way to the deep-draught ships, in localities where light draught vessels will not be liable to injury by using shoaler water.

HYDROGRAPHY.

The survey of the west coasts of Mexico and Central America has been continued by Commander Philip and the officers of the *Ranger*. The survey has been completed as far as the Gulf of Fonseca, and plates of this part of the work are being engraved. Work on this survey is progressing south and east of the Gulf of Fonseca under Commander Clark, who relieved Commander Philip on the 6th of October last.

Commander Kellogg, in the *Tallapoosa*, searched for reported dangers in the Yucatan passage off Cape San Antonio, island of Cuba. The examination proved that the dangers do not exist.

Commander Wildes, in the *Yantic*, found and located Marion Rock, which from its uncertain position had been considered dangerous to the navigation of the Straits of Florida.

Commander Reed and the officers of the *Alliance* surveyed the entrance to Tampico, Mexico, and the river as far as that city.

Commander Barker, in the *Enterprise*, without any appreciable delay on his way to the East Indies, ran a line of deep-sea soundings across the Atlantic Ocean to the Cape de Verde Islands, thence to the Cape of Good Hope. Soundings were also made off the coast of Madagascar, in the Mozambique Channel, and across the Indian Ocean.

For want of a definite sum of money, or of an additional printing press in the Navy Department for printing "Notices to Mariners," important information in regard to the positions of wrecks, obstructions in channels, changes of buoyage, and alterations in lights, cannot be given to the Navy and Mercantile Marine until after the lapse of such an interval of time as to often make the information of no value.

In order to more readily supply navigators with the maps, charts, and nautical books which the Hydrographic Office is authorized by law to sell at the cost of printing and paper, additional agents have recently been appointed in the cities on the coast, instead of restricting the agency to one firm in each city.

In continuation of the scheme proposed and begun by Lieutenant Maury, the suggestion as to the publication of a weekly wind and cur-

rent chart to contain information strictly nautical in character is a practical one, and is recommended.

In connection with the report of the officer in charge of the Hydrographic Office, I have the honor to call your attention to his suggestion in relation to the importance of printing charts from electrotypes taken from the engraved plates of surveys, instead of from the plates themselves. The latter process is an expensive one, and the appropriation asked for in order to electrotype the engraved plates is in the interest of economy.

Your attention is invited to the statement as to the great cost of reproducing certain foreign charts, and to the recommendation that the work of the Hydrographic Office in future should be more especially directed to the production of new charts from surveys made by our own officers.

I would also call attention to the recommendation as to the necessity of making new surveys of portions of the north coast of South America, of the island of San Domingo, and of various reported dangers in the Pacific Ocean. The charts of these localities are very imperfect and are known to be incorrect.

NAVAL OBSERVATORY.

The report of the Superintendent of the Naval Observatory treats in detail of the work performed with the several large instruments; of the addition of a temperature room for the more perfect testing of the chronometers issued to naval vessels, and of the proposed competitive trial of chronometers made in the United States; of the transmission of time signals, and of the computations made and publications prepared at the Observatory.

A large number of nautical instruments belonging to the Bureau have been examined and tested at the Observatory. This examination has developed the existence in many of the instruments of serious defects, which render them unfit for issue to the service.

I desire to invite your attention to the suggestion of the Superintendent, urging that a special appropriation be obtained with which to print the Observatory publications that have been ready for several years, but have not been printed on account of the insufficient amount appropriated for the printing and binding of the Navy Department. The great demand for these volumes renders their publication very desirable.

The Naval Observatory is prepared to give the time at any point in the United States to those who are prepared to receive it.

I desire to call attention to the defective construction of the buildings of the Observatory, and to the unsuitableness of their location, so often mentioned in previous annual and special reports, and to urge the necessity for an appropriation for the erection of new buildings, according to plans which have been approved by astronomers throughout the country, on the site selected by a commission appointed for the purpose and purchased by the Government.

Transit of Venus.—The observations for the recent transit of Venus were made by the parties at the stations mentioned in my last report, under instructions from the commission provided for by Congress, and of which the Superintendent of the Naval Observatory is the chairman. The sky was perfectly clear at half the stations on the day of the transit; at the others the work was more or less interfered with by clouds, but at no one station was there complete failure.

NAUTICAL ALMANAC.

The report of the Superintendent shows that the work of the office in preparing the annual volumes of the Nautical Almanac and Ephemeris is well in advance, the greater portions of those for 1887 being in type.

The discussion of the observations and experiments for determining the velocity of light, which were interrupted by the absence of the Superintendent in charge of the party observing the transit of Venus at the Cape of Good Hope, will soon be completed.

I invite your consideration to his suggestion that it may be well to consider the practicability of issuing an almanac more especially adapted to the use of coasting vessels, to contain additional information which would be of service to the large class engaged in the trade between our seaports.

Very respectfully,

J. G. WALKER,
Chief of Bureau.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

UNITED STATES HYDROGRAPHIC OFFICE,
Washington, October 20, 1883.

SIR: As directed by the Bureau, I have the honor to submit the following report on the condition of the Hydrographic Office as found by me when ordered to take charge on June 30, 1883, together with an abstract of the operations of the office for the fiscal year ending with that date, as shown by the records. In addition to the above I have thought it proper to state at length what appears to be the especial purpose of the office, and in connection therewith to submit recommendations for increasing its usefulness in the furtherance of the maritime interests of the country. To illustrate this statement it will be necessary to touch briefly upon the early work of the establishment.

PREVIOUS WORK OF THE OFFICE.

Lieut. M. F. Maury when in charge of the Naval Observatory and Chart Depot, which was at that time under the Bureau of Ordnance and Hydrography, began the collection of information from the logs of vessels, according to a carefully devised scheme, for the purpose of making charts to show the prevailing winds and currents, their limits and general characteristics, and, in general, all the physical features of the ocean, including its meteorology, the limits of icebergs, the feeding grounds of whales, and all facts of interest and value to the maritime community. It was a long time before important results were obtained, but gradually mariners of all nations became interested and sent their logs for examination. From the data thus gathered Lieutenant Maury constructed his famous wind and current charts and wrote his sailing directions. These charts and sailing directions have become known the world over, and the routes therein laid down for passages are followed to this day. It was estimated that the saving of time by the routes thus determined was equivalent to many millions of dollars annually. Two hundred thousand of the charts and twenty thousand of the sailing directions were distributed gratuitously to the masters of vessels who had contributed their logs. The continuance of this work, of invaluable benefit to the maritime interests of the world, was interrupted by the war, Maury's last publication appearing as Monograph No. 3, in May, 1861.

The Hydrographic Office was definitely established by the act of Congress approved June 21, 1866, now embodied in the Revised Statutes, as follows (§ 431):

There shall be a Hydrographic Office attached to the Bureau of Navigation in the Navy Department, for the improvement of the means for navigating safely the vessels of the Navy and of the mercantile marine, by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States, and for the benefit and use of navigators generally.

An appropriation was made at about the same time for the purchase, from Messrs. E. & G. W. Blunt, of New York, of Bowditch's Navigator and of a number of copper plates of charts of the several oceans and of the waters adjacent to the coast of the United States, but not including the coast lines. A new edition of the Navigator was published, and charts were printed from the plates and sold to the merchant marine as they were called for. The plates of Maury's Wind and Current Charts were turned over to the Hydrographic Office, as well as those prepared under a special appropriation from the surveys made by the expeditions under Wilkes, Rodgers, Perry, and Page. To supply our ships-of-war with charts of every part of the world, copies were purchased of those published by the British admiralty. A considerable number of admiralty charts have been reproduced, some in copper plate, but the greater part by photolithography. The latter method commended itself as being at the outset a cheap and rapid method of chart-making, but, for reasons that will be explained later, it has become in the end a source of expense and inconvenience. Its disadvantages have been represented annually to the Bureau, and in 1882 an appropriation of \$15,000 was made for the transfer of the photolithographic charts to copper. Contracts covering this amount have been made, and the copper plates are now being received.

As provided for in the statute establishing the Hydrographic Office, books relating to navigation, sailing directions, and other information of use to the navigator have been prepared from time to time and published, correspondence has been carried on with foreign hydrographic offices, and the information thus obtained has been republished in the form of Notices to Mariners, which have been distributed gratuitously to marine agencies and insurance companies and to masters of vessels who have applied for them.

Efforts were resumed in 1873 to collect meteorological data from the merchant service for a new edition of Maury's charts, and with the additional information obtained during the last twenty years from the logs of our ships-of-war, a set of charts for the North Pacific has been prepared and published.

The work of the office, as now organized, is arranged in six divisions: Plate and printing; charts; British admiralty charts; books; notices and archives; drafting and engraving; and meteorology.

PLATE AND PRINTING DIVISION.

The copper plates belonging to the office in the plate and printing division, and available for use in printing, are as follows:

Purchased from Messrs. Blunt.....	27
Exploring expedition plates transferred to office.....	112
Prepared by office, finished.....	140
Prepared by office, unfinished.....	25
Maury's Wind and Current Charts.....	24
Total	328

The number of charts printed from the above plates during the year was 9,997.

The original cost of engraving the 165 plates prepared by the office has been upwards of \$150,000.

From an examination of the various Government offices, and of private copper-plate printing establishments in New York, it appears that it is the universal custom to make at least one electrotpe or alto of all engraved plates. From this alto a second electrotpe or basso is made from which impressions can be taken. The original plate is thus relieved of wear and its life is prolonged indefinitely, since new electrotypes can be made from it at any time. The practice of electrotyping plates has not hitherto prevailed at the Hydrographic Office, only 5 out of the 328 plates having been reproduced in alto, and only 4 of these in basso. As a measure of economy, all the plates in the office should be immediately electrotyped. Unless this is done, it will be necessary to recut the plates as they wear out. Many of them already show signs of wear. By electrotyping before the deterioration begins, and printing from the basso, which is in every respect a perfect copy, the original will be permanently available for new electrotypes. As the cost of electrotyping is less than 5 per cent. of that of engraving, and as an indefinite number of reproductions can be made by the process, the importance of applying it to all the plates before they become imperfect needs no further argument. I have submitted an estimate of \$5,000 for this purpose, and also an estimate for the employment of an electrician in the office to perform the work.

CHART DIVISION.

The chart division has charge of all charts kept for issue to vessels except original charts of the British admiralty. They include charts printed from copper plates in the plate and printing division; reproductions on stone of British admiralty charts, together with a few original French charts; and charts of the United States Coast Survey.

The number of copies on hand June 30 was as follows:

Designation of charts.	Number of charts.	Number of copies.
From copper plates:		
Blunt's charts	27	10, 000
Exploring expedition charts	112	
Office charts, finished	140	
Office charts, unfinished	25	
Maury's charts	24	22, 000
From stone	510	83, 000
	838	115, 000
Deducting the wind and current charts	24	22, 000
Total sailing charts	814	93, 000

The number of charts issued during the year was as follows:

To ships of war	3, 539
To merchant vessels transmitting meteorological journals	837
To home correspondents and libraries	481
To foreign hydrographic offices (exchanges)	519
To agents, for sale	5, 628
To navy-yards and Government offices	1, 163
Total	12, 167

4,609 Coast Survey charts were received, and 3,718 were supplied to ships of war.

The number of charts sold to agents during the fiscal year was as follows:

	Copies.
27 copper plates (Blunt).....	2,817
74 copper plates, office	1,120
26 copper plates, exploring expedition.....	111
Total of engraved charts	4,138
172 on stone (photolithographic).....	1,490
299	5,628

ADMIRALTY CHART DIVISION.

The hydrographic office connected with the British admiralty has published a series of charts numbering about 3,000, and representing bodies of water in all parts of the world. From 75 to 100 charts are issued and about double the number receive important corrections annually. The series forms the most complete collection in existence, and the navigators of all countries, whether naval or mercantile, must rely primarily upon this office for their charts. Of these publications the admiralty chart division of the Hydrographic Office keeps at all times a supply. At present the aggregate number of copies on hand is 16,000, representing 2,300 charts. Every new chart and every chart having important corrections is received from the British admiralty at the Hydrographic Office as soon as issued. It has hitherto been the practice, upon the receipt of a new edition of an admiralty chart, to correct from it the old copies on hand in the office. These corrections, made upon each copy of the chart in pen and ink, not only involved great labor and expense, but were of necessity imperfectly made. While slight corrections must continue, as before, to be entered by hand, it is now proposed, in the case of new editions, to adopt the simpler and far less expensive plan of replacing the old copies by the purchase of new ones.

Since the first of July the whole collection has been carefully examined and several thousand have been found to be so old and imperfect as to be radically defective guides for the navigation of vessels. They have consequently been condemned and new charts of the latest date have been ordered to replace them.

As admiralty charts are sold at an average price of 2s. a copy, and as the cost of correction of a seriously defective chart may amount to \$25 a copy, there can be no question as to the wisest policy for the office to pursue.

The production of sailing charts is in some respects the most important function of the Hydrographic Office. Of the 789 charts issued by the office, those which embody the results of the exploring expeditions, 112 in number, are original. Thirty of the 140 office charts are also based upon original surveys made by United States vessels. The remaining 647, or 80 per cent of the whole number, are reproductions of foreign charts, mainly those of the British admiralty.

It has hitherto been the policy of the office to devote a large portion of its energies to this work of reproducing foreign charts. One-fifth of the whole number of publications of the British admiralty have been copied on stone or on copper and the charts printed therefrom have been stored in the office. They are kept for the double purpose of issue to ships of war and of sale to private individuals. It is a question whether

they are of any material benefit. The copper plate reproductions are exceedingly costly. They have, however, an advantage over the photolithographic copies, in that corrections may be made on the copper and new copies may be printed from the plate as corrected.

The photolithographic reproductions, while less expensive at the outset, can only be corrected by alterations on each copy of the chart in pen and ink. The waste of labor and the waste of money in this hand correction of 83,000 charts is simply inconceivable, and, moreover, it could not be adequately and accurately accomplished with even unlimited labor and money. The office has for some time made the attempt to perform this task, but after a protracted trial the conviction is formed that it is impossible, and that, if it were possible, it would not be worth the effort. The obsolete charts, instead of being laboriously corrected, should be replaced by the purchase of new editions from the corrected plates of the British office. The conclusion is therefore irresistible that no more copies should be made of foreign charts by a process which does not admit of correction on the original plate or stone. It is a further question how far reproductions of any kind are desirable. Certainly, if the policy of reproduction is a sound one, it should be clearly apparent why these particular 620 charts were chosen for reproduction and the 2,380 others on the admiralty catalogue were rejected. It is impossible, however, to ascertain any general principle which has hitherto governed the selection. The copies form a miscellaneous collection, comprising localities widely distributed and of varying degrees of importance, including the waters of every ocean and coasts and harbors on every continent. That most of them serve no useful purpose is evidenced by the fact that of the 620 charts copied, copies of only 216 have been sold, leaving 404 for which there has been no demand whatever during the past year. Many of these last have been issued to ships of war, but an ample supply for this purpose can be obtained by purchasing copies, without the expense of reproduction.

It is my opinion that a certain portion of this work can be continued to advantage, but that it should be confined absolutely to the coasts and waters that are most frequently navigated by the merchant vessels of the United States. In particular, those admiralty charts of the waters adjacent to the American continent, as far as they have been based on actual surveys, should be engraved by this office, in order that, the plates being always here, corrections may be made at once from the information at its command, and mariners supplied with charts of the highest accuracy, which could otherwise be obtained only with considerable difficulty and delay. Within these limits the work of reproduction should be strictly confined.

By limiting this branch of chart work as above described, the Hydrographic Office will be enabled to devote its energies to the work for which it is peculiarly fitted and intended—the performance of its share of general hydrographic work by the publication of original surveys made by officers and vessels of the United States Navy. The British admiralty, extensive as have been its hydrographic labors, has covered only a limited portion of the general field; another portion, that of our own coasts and harbors, is in the hands of the Coast Survey. But much remains to be done in waters frequented by American commerce which neither British nor American surveys have yet mapped out. The Pacific Ocean lies before us; Wilkes' expedition was little more than a reconnaissance, and there are nearly 3,000 reported dangers in the Pacific which have not yet been verified.

The charts of the north coast of South America and of many parts of

the West Indies are based on imperfect surveys made many years ago, and are of little assistance to the navigator. Our commercial interests absolutely demand that new surveys should be made in order that adequate charts may be constructed. I would particularly call attention to the Mona Passage, the coasts of Porto Rico and San Domingo, Sabanilla Bay in New Granada, and, in fact, to the entire northern coast of South America.

A number of geographical positions along the coast of South America were established in 1877 by Commander Ryan in the U. S. S. *Huron*, of which the longitude was based on that of the water battery at Fort Spain and that of the light-house at Aspinwall, which had been established previously by telegraph. These determinations showed errors in longitude in the charts of from three to six miles at the positions occupied. To place correctly on our charts the points thus established, and to connect them by the old coast line, is impossible. A continuous survey should be made to connect these positions and complete the work already partially done.

The work of the United States in this direction has so far been confined to the 112 charts which were the result of the exploring expeditions, and to the recent admirable surveys of the *Narragansett*, the *Enterprise*, the *Despatch*, and the *Ranger*. These surveys have mapped out, with a completeness and accuracy which have never before been exceeded, the Gulf of California, the waters of the Amazon, the Bay of Samana, and the west coast of Mexico and Central America.

The publication of the results of original surveys by American officers should be the primary work of the naval Hydrographic Office.

DIVISION OF BOOKS.

In the division of books there are 20,000 copies of the publications of this office, of the United States Coast and Geodetic Survey, and of the Light-House Board, and others purchased abroad for the use of our naval vessels. The first only are kept for sale. Several copies of each publication are always kept corrected to the latest date. The correction of the books imposes a heavy burden on the office force, but by arranging the notices to mariners according to separate localities, and by printing yearly supplements embodying the notices for that period, much time will be saved and greater convenience of reference secured.

A supplement to Hydrographic Office publication No. 44, on the navigation of the Straits of Magellan, has been prepared and published.

There have been issued to United States naval vessels, vessels of the Coast Survey, public institutions, and foreign hydrographic offices, 2,390 copies of the publications of the office; 693 copies have been sold through authorized agents.

The charts and books published by this office have been kept for sale by an agent in each of the principal maritime cities, who was allowed a discount of 40 per cent from the office price. No charts could be obtained by individuals or by the trade generally except through this agent, and other chart dealers were obliged to pay him an advance of from 10 to 20 per cent if they wished to sell the Office publications to their own customers. The system of single agencies was of advantage only to the agent, and was, to some extent, an obstacle to the circulation of the publications of the office. It has been thought best to abolish it, and to permit any reliable dealer who may wish to sell our charts to have them on the same terms.

NOTICE AND ARCHIVE DIVISION.

The division of notices and archives contains single copies of 7,000 American and foreign charts, kept for reference. In this division is also filed all nautical information, from whatever source received. During the year there have been received, from twenty-eight foreign hydrographic offices and marine and port departments, 2,150 printed notices. The notices in foreign languages, including Chinese and Japanese, as well as those of nearly every country in Europe, have been translated by naval officers attached to the division. The information obtained from the notices has been republished in notices to mariners, indicating changes of lights and buoys, and in hydrographic notices, indicating changes in hydrography.

During the year, 171 notices to mariners have been issued, containing 934 announcement of changes and 66 hydrographic notices, containing 415 announcements. Five hundred copies of each notice have been printed. They were distributed to the naval stations, the ships-of-war, foreign hydrographic offices, boards of trade, marine insurance companies, and masters of vessels who applied for them.

In view of the urgent character of new information for mariners, and the necessity of promptness in publishing notices, it is important that a specific amount of money should be provided for rapid printing. Under the present system, it is possible that the Department appropriation for printing may be exhausted before the close of the fiscal year, subjecting the necessary work of the office to protracted delays; and even under the most favorable circumstances, with the ordinary routine of requisitions to the Public Printer, a week or ten days will almost surely elapse before the shortest notice can come out.

DRAFTING AND ENGRAVING DIVISION.

This division has been unusually taxed by the extensive corrections made necessary by recent foreign surveys, by reports from the commanding officers of our ships-of-war, and by other special causes. Corrections have been made in 20 charts in manuscript and engraved on the corresponding plates. Minor corrections, such as changes in lights and buoys, and in the position of small shoals, in placing new shoals, and in the removal of those proved not to exist, were made on 64 plates. A detailed statement of the work of this division is appended.

METEOROLOGICAL DIVISION.

The province of the meteorological division is to furnish blank meteorological journals to the masters of merchant vessels who are willing to post them, the masters receiving in return a set of charts covering the route to be traversed. The data obtained from these journals and from the log-books of ships-of-war are condensed for use in the construction of new editions of Maury's Wind and Current Charts. During the past year 54 journals were received from the masters of merchant vessels, and 284 were issued. The compilation necessary for a new chart of the North Atlantic has been finished, and a series of 12 charts on a new and graphic system is now in the hands of the engraver, and will be ready for issue in about one year.

BRANCH OFFICES.

Hitherto the office has not been able to extend the full benefit of its co-operation to the merchant marine, owing to its remoteness from the

class of people it was intended to benefit, and to the natural hesitation of the latter to take the initiative in availing themselves of its resources. In order to supply this want, it was necessary to take some steps to bring the office into closer and more direct relations with seafaring men. To this end branch offices have been established in Boston, New York, and Philadelphia, in rooms provided through the generous liberality of the Board of Trade in Boston, and of the Maritime Exchanges in the other two cities. The branches have been placed in charge of officers detailed from this office, with the approval of the Department. Each branch is supplied with charts covering the navigable waters of the globe, nautical works, light lists, and sailing directions, all corrected to date. The plan has the double advantage of placing within easy reach of masters of vessels all the information contained in the Hydrographic Office, and of enabling the office to obtain, with incomparably greater fullness, accuracy, and dispatch, all the information brought to those ports by incoming navigators as the fruit of their own experience.

GENERAL RECOMMENDATIONS.

In furtherance of the recommendation made in the early part of this report, the office will shortly present a statement of the surveys most urgently needed at the present time, to be executed by vessels of the Navy, showing the size and scale of proposed charts and the extent of coast to be covered. A definite programme should be decided upon and carried out, and the Hydrographic Office should be utilized to publish the results of the surveys.

In carrying out and developing the work begun by Maury, but by methods more in keeping with the spirit of the age, I would recommend the publication of a weekly wind and current chart of the ocean, giving only nautical information. With the increase of commerce, the large number of fast steamers crossing the ocean, and the facilities afforded by the submarine cable, a vast amount of valuable information can be collected weekly. With the methods that have been in use hitherto, the information obtained must lie idle for months, if not for years. A weekly edition of Maury's chart would show, in addition to the information hitherto presented, the track of recent ocean storms and the probable weather at sea for the coming week. It would also be invaluable to the mariner by showing in a graphic form the probable limits of the Gulf Stream, drift icebergs, the best tracks for steamers, reported rocks, shoals, and other marine dangers, the establishment of new lights, and changes in the position of buoys. The necessary information can be collected by the newly-established branch offices, from the captains of ocean steamers and ships-of-war, and from the masters of merchant vessels generally, without cost to the Government. An estimate of \$10,000 is submitted as the amount necessary to obtain the plant for carrying this important plan into operation for the first year.

I would further recommend that regular observations be made, on board of the vessels of the Navy, of the most important physical features of the ocean. It is certainly the sphere of the Hydrographic Office to promote investigations of such a nature as shall be of use both to the mariner and to the student of science. The investigations which would be of the greatest advantage and importance are in the direction of wave motion, deep-sea soundings, and ocean temperature. The necessary steps have already been taken by the Department for investigating wave motion, and blank forms for reports of observations have been prepared at this office. In the matter of deep-sea sounding, it is rec-

ommended that all our naval vessels should be provided with sounding apparatus, and when cruising in open water should be obliged to sound, especially at points where the depth is not shown on the charts. It would not be many years before these observations would result in the mapping out of the complete contour of the ocean bed, and the existence of all reported dangers could be fully determined.

In reference to the temperature of sea water, it is recommended that more frequent and careful observations should be taken on board our vessels. The observation of surface water alone is not sufficient, but suitable thermometers should be furnished, and temperatures taken to at least 10 fathoms in depth, and, if possible, down to 100. These temperatures will give the elements to determine the actual circulation of the ocean, and careful observations of the density of sea water will suggest the laws governing this circulation. The above observations, together with detailed reports of all novel phenomena, should be sent in, and the information thereby obtained be made generally available by the publication of monographs prepared and distributed by the Hydrographic Office.

Very respectfully, your obedient servant,

J. R. BARTLETT,

Commander, U. S. Navy, in charge Hydrographic Office.

Commodore J. G. WALKER, U. S. N.,

Chief of Bureau of Navigation.

APPENDIX.

UNITED STATES HYDROGRAPHIC OFFICE.

SPECIAL INFORMATION FROM UNITED STATES NAVAL CRUISERS.

Reports and various information of interest have been received and utilized by the office from the following sources:

Capt. A. W. Johnson, U. S. S. Powhatan, made a thorough examination of a reported shoal off Cartagena, United States of Colombia.

Capt. Bancroft Gherardi, U. S. S. Lancaster, sent information concerning the harbor of Cadiz, Spain.

Capt. A. W. Weaver, U. S. S. Brooklyn, reported in regard to new light-houses in the Rio de la Plata, and also concerning Santa Cruz, Patagonia.

Capt. Henry Wilson, U. S. S. Lackawanna, reported the non-existence of Danger No. 1123, South Pacific, after a thorough examination.

Capt. Joseph Fyffe, U. S. S. Pensacola, sent important information concerning the Straits of Magellan and the west coast of South America.

Capt. C. C. Carpenter, U. S. S. Hartford, reported in regard to Magellan Straits and the west coast of South America, and also made a survey of Caroline Island, South Pacific.

Capt. R. R. Wallace, U. S. S. Vandalia, sent important hydrographic information concerning the West Indies, and Beaufort River anchorage, South Carolina.

Commander A. V. Reed, U. S. S. Alliance, reported hydrographic information regarding ports in the West Indies, and also made a survey of the Panuco River, east coast of Mexico.

Commander J. W. Philip, U. S. S. Ranger, has continued to send in the results of his survey of the Mexican coast as far as completed. They now extend to the Gulf of Fonseca.

Commander H. E. Mullan, U. S. S. Ashuelot, reported a light on Volcano Islands, China.

Commander W. R. Bridgman, U. S. S. Kearsarge, sent important information regarding different ports in the West Indies.

Commander A. H. McCormick, U. S. S. Essex, reported hydrographic information concerning west coast of South America.

Commander A. S. Barker, U. S. S. Enterprise, reported three series of deep-sea soundings from latitude $35^{\circ} 35'$ north, longitude $48^{\circ} 22'$ west to the Cape de Verde Islands; from the latter to Cape Town, and also in Mozambique Channel, and off the coast of Madagascar.

Commander O. A. Batcheller, U. S. S. Galena, communicated information concerning a shoal at Colonia, Uruguay, and the navigation of La Plata.

Commander H. C. Taylor, U. S. S. Saratoga, sent information concerning the harbor of San Juan, Porto Rico, and also Mona Passage.

Commander F. Wildes, U. S. S. Yantic, made a thorough examination of Marion Rock, Gulf of Florida.

Commander A. G. Kellogg, U. S. S. Tallapoosa, made a complete examination of Antonio Knoll.

Commander J. H. Sands, U. S. S. Iroquois, reported the establishment of a new light on the coast of Ecuador.

Commander P. F. Harrington, U. S. S. Juniata, sent information concerning a rock in the Red Sea.

Commander N. Ludlow, U. S. S. Quinnebaug, reported concerning the Cape de Verde Islands and the west coast of Africa.

DETAILED STATEMENT OF THE OPERATIONS OF DIVISION OF DRAFTING AND ENGRAVING.

A harbor plan of Port Ushuwia, a mission station in Patagonia, from a recent British survey, has been engraved on the plate of chart 453.

Chart No. 19, Bahama Banks and Gulf of Florida, on which the engraving was worn out, has been recut.

The plate of chart 622, west coast of Mexico, from Cape Corrientes to Tenacatita Bay, has been corrected by engraving a new survey made by Commander J. W. Philip, after erasing incorrect coast-lines and data from previous foreign surveys.

A plan of the recent examination made by Commander A. G. Kellogg, of the dangers off the west end of the island of Cuba, has been prepared and photolithographed.

Photolithograph chart No. 510, Hancock Bay, has been replaced by an engraved chart from a new survey.

A chart of the Bay of Samana, No. 917, and a special chart of Port Santa Barbara and approaches, have been prepared from the surveys made by the officers of the United States steamer Despatch, Commander W. R. Bridgman commanding, and are now in the hands of the engraver.

A chart of the world on Mercator's projection, No. 923, on a scale of $2\frac{3}{10}$ inches to 10 degrees of longitude, has been compiled from the most recent authorities, and is now in the hands of the engraver.

A copy of the admiralty chart of the northeast coast of Newfoundland has been prepared for publication, as chart No. 924; this, now in the

hands of the engraver, will complete the Newfoundland sheet charts of this office.

The survey of the west coast of Mexico and Central America, under the direction of Commander J. W. Philip, from Cape Corrientes to the Gulf of Fonseca, has been prepared and divided into charts under the following titles, viz:

No. 933. West coast of Mexico from Perula Bay to Maldonado.

No. 932. From Maldonado to Ocos River.

No. 931. West coast of Central America from Ocos River to Port San Juan del Sur.

Second editions of the following-named photolithographic charts, which have become worthless on account of changes, have been prepared and are in the hands of the engraver:

No. 394, western shore of the Caribbean Sea from the Man-of-War Cays to Chinchorra Bank.

Nos. 796, 797, 798, and 799. China Sea, in four sheets.

No. 443. Magellan Straits, eastern sheet.

No. 444. Magellan Straits, middle sheet.

Nos. 446*a* and 446. Channels between Magellan Straits and the Gulf of Trinidad, in two sheets.

Nos. 447*a* and 447. Channels between the Gulf of Trinidad and Peñas, in two sheets.

Copper plates for the following charts have been received from the engravers, corrected to date, and the charts are now ready for issue:

No. 903. West coast of North America from Juan de Fuca to Queen Charlotte Islands.

No. 904. West coast of North America from Queen Charlotte Islands to Dixon Entrance.

No. 445. Magellan Strait, western part.

No. 373. Jamaica, with Pedro and Rosalind Banks.

No. 915. Manzanilla and Santiago Bays, west coast of Mexico.

No. 916. Ports on south side of Cuba.

No. 909. South side of Behring Strait, Providence Bay, Plover Bay, and Emma Harbor.

No. 910. Anadyr Gulf, Behring's Sea.

No. 348. Port Royal and Kingston Harbors.

The engraving of the extensive corrections on the charts of the Brazil coast is completed.

No. 809. Coast of Labrador, from Cape Saint Charles to Sandwich Bay, is still in the hands of the engraver.

During the last six months of the fiscal year the entire force of draftsmen in this division has been almost constantly employed preparing charts for the heliogravure process. The following have been reproduced and the plates received; they will replace photolithographic charts of the same localities:

No. 920. Port Malaga, Spain.

No. 424. How Harbor, Newfoundland.

No. 922. Gonaives Bay, Hayti.

No. 921. Port Altata, from surveys by officers of U. S. S. Ranger.

No. 452*a*. Barbara Channel, Magellan Straits.

No. 452*b*. Ports in Barbara Channel.

No. 695. Molyneaux Sound and Portland Bay, Conception Channel.

No. 720. Port Ponce, Porto Rico.

No. 451*a*. Port Grappler and Mayne Harbor, Indian Reach, Patagonia.

No. 451*b*. Port Otway and Port Barbara, Patagonia.

No. 432*c*. Weeks Island, Magellan Straits

No. 452*d*. Coast from Glascott Point to Cape Isidore, Port San Antonio, Cordes Bay, and Labyrinth Islands, Patagonia.

No. 455*a*. Gretton Bay, in the Wollaston Islands.

No. 455*b*. Goree Road, Terra del Fuego.

No. 455*c*. Good Success Bay and Lennox Cove, Terra del Fuego.

No. 455*d*. Pack Saddle Bay, Terra del Fuego.

No. 455*e*. Saint Martin Cove, Terra del Fuego.

No. 455*f*. Townsend Harbor, Terra del Fuego.

There are also 49 photolithographic charts in the hands of contractors to be transferred to copper. Their titles are as follows:

No. 925. Guia Narrows to Conception Channel, Patagonia.

No. 926. Harbors in Trinidad Channel, Patagonia.

No. 913. Port Henry, Patagonia.

No. 266. Plans on the west coast of Patagonia.

No. 10. Tom Bay Anchorage, Patagonia.

No. 570. Indian Reach, Patagonia.

No. 146. Puerto del Morro and Cockle Cove, Trinidad Gulf, Patagonia.

No. 269. Port Tamar and other harbors in Magellan Strait.

No. 260. Port Gallant and other harbors.

No. 264. Port Angosta, Playa Parda Cove.

No. 450*a*. Royal Sound, Magellan Straits.

No. 450*b*. Gregory Bay and Sandy Point Road.

No. 12. Staten Island, Terra del Fuego.

No. 38. Ports of Valdivia and Corral, Chili.

No. 563. Conception Bay, Chili.

No. 491. Santos Harbor, Chili.

No. 499. Port Maldonado, Rio de la Plata.

No. 503. Colonia Roads, Rio de la Plata.

No. 521. Port Cienfuegos, Cuba.

No. 377*a*. Anchorages on the east end of Cuba.

No. 377*b*. Port Guantanamo, Cuba.

No. 518*a*. Ports Jaragua, Yamanigüey, and Cayo Moa, Cuba.

No. 519*a*. Ports Sama, Yaguanique, Cananova, and Naranjo, Cuba.

No. 519*b*. Ports Gibara, Bariiai, Padre, and Banai, Cuba.

No. 519*c*. Ports Jururu, Nipe, Vita, and Cabonico, Cuba.

No. 520*a*. Ports Cabañas and Cardenas, Cuba.

No. 520*b*. Ports Bahia-Honda and Mariel, Cuba.

No. 520*c*. Ports Nuevitas, Nuevas Grandes, and Manati, Cuba.

No. 270. Cay Frances Anchorage, Cay Confites Anchorage, and Port Matanzas, Cuba.

No. 371*a*. Crocus Bay and other points in the Antilles.

No. 371*b*. Sombrero Island, West Indies.

No. 135. San Fernando Anchorage, Trinidad.

No. 364. Harbor of Point à Pitre, Guadaloupe.

No. 43. Grand and Lesser Caymans, West Indies.

No. 372. Anchorages in Porto Rico.

No. 597*a*. Bay of Islands, Newfoundland.

No. 276. St. Miguel Island, Azores, with plans.

No. 147. Ports in the sea of Marmara.

No. 143. Anchorages on the southeast coast of Spain.

No. 267. Harbors on the west coast of Nipon, Japan.

No. 268. Nanao Harbor on the northwest coast, Japan.

No. 508*a*. Anchorages on the west coast of Yesso, Japan.

No. 141. Anchorages on the coast of Tsusima, Japan.

No. 48. Aburatani Harbor, Japan.

No. 648*a*. Anchorages in the Bingo Nada, Japan.

No. 819. Anchorages in the Suwo Nada and Harima Nada.

No. 66. Ports Hiogo and Osaka, Japan.

No. 47. Ports on the east coast of Corea.

No. 416. Mokha Road, Red Sea.

A large number of tracings and drawings were made for the Jeanette Board and the Secretary's office.

The following work was left unfinished in the previous fiscal year 1881-'82:

General chart of the North Atlantic Ocean, 4 half sheets.. Received from the engraver in 1880.

General chart of the South Atlantic Ocean in 4 half sheets. Received from the engraver in 1881.

General chart of the South Pacific Ocean, 8 half sheets, two of which were issued in 1878. Received from the engraver 1879-'80.

Chart of the Mediterranean, 3 sheets. Received from engraver 1881.

Chart of the channels between the North and Baltic Seas. Received from the engraver 1882.

The above-named plates were received from the engraver's hands at the dates mentioned, finished in part as provided by contracts, but owing to the press of current work were never completed.

The general sailing charts are the most important issued by this office, and will be immediately taken in hand and completed.

The engraving of the new chart of Hong-Kong has been postponed until the uncertainty arising from discrepancies in the latitude, as given by different authorities, has been removed.

J. R. BARTLETT,
Commander, U. S. N.

UNITED STATES NAVAL OBSERVATORY,
Washington, October 22, 1883.

SIR: I have the honor to submit the following report of the work of the Observatory during the past year. I assumed the direction of the institution on the 1st of May, relieving Vice-Admiral S. C. Rowan.

THE 26-INCH EQUATORIAL.

This instrument has been in charge of Prof. A. Hall, with Prof. E. Frisby as assistant. Mr. George Anderson is employed as an assistant in the dome. The instrument is in good order, and has not been changed in any respect. The dome has become a little elliptical and is difficult to move, and this is now the laborious part of the working of this instrument. Probably a small gas engine could be employed with advantage. During heavy rains a good deal of water has collected in the cellar from the gangway, and to prevent this a roof has been put over the gangway. The brick pier in the dome on which the sidereal clock was mounted was cracked several years ago, and being very unsteady the clock stopped frequently. To remedy this a new pier for the clock has been built outside the foundation wall of the dome. The canvas cover for the opening of the dome is still used, and a change in the raising and lowering of this covering has been made in order to avoid the friction of the wire ropes. Thus far the new arrangement has worked well. The chronograph performs well, and gives very little trouble. It was designed and built by Alvan Clark & Sons, nine years ago.

This equatorial has been employed, as in preceding years, for the observation of double stars, satellites, and comets. The double stars which are observed are those that have large angular motions, or which present some interesting peculiarities, and a few of the old and well-known pairs that are observed for the purpose of connecting our measures with those of other observers. After a few years it is intended to resume observations of other double stars and of some of the groups.

The satellites of Saturn, Uranus, and Neptune have been observed, and we have now collected a large number of observations of these satellites.

The ring of Saturn has been carefully observed, but no remarkable changes have been noticed. In fact, many of the strange phenomena frequently described in connection with this unique ring the observers here fail to see on the best nights. During the greatest opening of the ring, which is near at hand, it is intended to make a set of micrometric measures of the dimensions of the ring. These will be rather of relative value for comparison with past and future measures, since the heliometer seems to possess decided advantages for absolute measures of this kind. A new series of measures of the satellites of Uranus was begun in 1881, the position of this planet having become such as to give an opportunity for a better determination of the planes of the orbits of its satellites. This series will be finished next year, and a discussion of the observations should be made.

Some observations for stellar parallax have been undertaken, but as the observer resides at some distance from the observatory, such work is very laborious, and it seems better to defer it until more convenient arrangements are made. At the present time the pressing need on this instrument is that the observations of satellites already made should be discussed for the purpose of correcting the orbits of these satellites, and of determining the masses of the planets. This discussion has been begun, and the numerical calculations are being made by Ensigns W. H. Allen and J. A. Hoogewerff.

Professor Frisby has made a series of observations of small stars within four degrees of the pole, for determining the value of one revolution of our micrometer screw. The positions of the stars have been determined on the meridian circle. The resulting value will not differ essentially from the value found by Professor Holden, and which has been adopted in our reductions.

In the spring, our 26-inch glass was examined by Mr. Otto Struve, director of the Imperial Observatory at Pulkowa, and his son Mr. Hermann Struve, preliminary to their examination of the 30-inch objective made by Alvan Clark & Sons for the Pulkowa Observatory. This great objective, the largest yet made, proved to be satisfactory, and it is now in Russia.

THE TRANSIT CIRCLE.

This instrument, in charge of Prof. J. R. Eastman, was employed in the same class of work as in 1881-'82. The observers were Professor Eastman and Assistant Astronomers A. N. Skinner, Miles Rock, and W. C. Winlock. Professor Eastman was absent in charge of a Transit of Venus party at Cedar Keys, Florida, from November 1, 1882, to January 1, 1883; Assistant Astronomer Miles Rock, who was detached in September, 1882, for duty with the Transit of Venus party at Santiago, Chili, was away until February 10, 1883. The whole number of observations made with the Transit Circle from October 18, 1882, to October

18, 1883, is 3,880. Of these, 62 were of the sun; 47 of the moon; 96 of the major planets; 78 of the minor planets, and 15 of comets.

The meteorological observations have been continued, as in former years, by the watchmen.

THE 9.6-INCH EQUATORIAL.

This instrument has been in charge of Commander W. T. Sampson, assisted part of the time by Lieut. W. E. Sewell, and part of the time by Lieut. John Garvin. It has been used, as in former years, in observations of the phenomena of Jupiter's satellites, occultations by the moon, places of comets, and for obtaining corrections to the Ephemeris-places of minor planets.

PRIME VERTICAL INSTRUMENT.

This instrument is in charge of Lieut. C. G. Bowman, assisted by Ensign H. Taylor. Observations with it were recommenced November 14, 1882. The first observations were by the "eye and ear" method, but since December 2 they have been recorded chronographically, using Howard clock No. 627, and a Bond chronograph. The error and rate of the observing clock have been determined by chronographic comparisons with the east transit clock, not only during each set of observations, but as near as might be at the time of the determination of its error by observations with the east transit. The Howard clock has maintained constantly a small and very regular rate. The azimuth and collimation of the instrument were reduced to small amounts from the early observations, and have not since materially changed. The pivots were found to be in good condition and very slightly unequal, the effect of which, however, is eliminated by reversal of the instrument during observation. The level used is one furnished for the instrument by Würdemann. The level has been reversed with the instrument, four careful readings being taken immediately before commencing the observation, and four others immediately after completing it on each vertical. Continuous observations have been restricted to about forty stars, in no case exceeding 2° zenith distance when on the meridian; and these, with one exception, have been closely confined to the time of the two maxima of aberration. The one exception referred to was in the case of α Lyræ, which has been regularly observed throughout the 24 hours, having in view the possibility of a determination of its absolute parallax.

Until March, 1883, all observations, except of α Lyræ, were taken in the evening. Since then observations have been continuously taken every morning and evening, except on Sunday, when permitted by the weather, or not interrupted by the sickness or absence of an observer. Up to this time about 580 observations have been secured. This number would have been very considerably increased were it not that a star of only 1° in zenith distance (when on the meridian) has an interval of about two hours between the two verticals, and thus stars observed on one vertical have been often lost on the other through a change in the weather. This has frequently been the case in the morning, when, after securing several observations on the east vertical, all have been lost on the west. In the reductions, W. Struve's formulæ have been used, and the labor has greatly lessened by the use of Otto Struve's auxiliary tables for the prime vertical transit.

MERIDIAN TRANSIT INSTRUMENT.

This instrument has been in charge of Lieut. U. R. Harris, and Lieut. E. C. Pendleton has assisted. Since July 10, Lieutenants Pendleton and Harris have alternated daily in determining the correction of the standard mean-time clock. Ensign S. J. Brown checked the computation of work already completed. The meridian transit instrument has been used for the observations of stars of the American Ephemeris, for clock and azimuth corrections, and the determination of the right ascensions of the sun, moon, and major planets. The total number of observations of the character mentioned is 1,408; of which 592 have been completely worked up for final results.

The sun was observed 93 times; the moon 39 times; and there were made 174 observations of the major planets. Whenever possible the time of sidereal passage of semi-diameter over the meridian has been observed.

Observations have been taken as often as practicable to obtain each day the correction of the standard mean-time clock for setting to correct time the transmitting clock, which is used in sending out the time-signals from the chronometer room, and in rating the chronometers. The standard mean-time clock is compared with the sidereal clock at the time of observation upon the chronograph. The sidereal clock used in the meridian-transit room has performed but fairly throughout the year. The rate is large and varies from plus to minus. The clock is not inclosed, and is subject to the varying conditions of the weather. The meridian transit is in condition to perform any work which belongs to it. The inequality of pivots has been measured, and the equatorial intervals of the present set of threads have been determined. The work, not yet completed, has been measured from the chronograph sheets and entered in the observing books. When the level correction has been measured, temperature has been recorded. A sufficient number of observations indicate that the level varies with the temperature in this instrument owing to the difference in the height of the metal Y's. The collimation correction remains practically constant, varying but little through long intervals of time. The azimuth correction seems to be capricious, remaining quite steady for a period, and at once making a change with sudden changes of temperature. This is perhaps due to the manner in which the Y's are secured to the piers.

CHRONOMETERS.

This department of the Observatory is in charge of Lieut. E. K. Moore, assisted by Lieuts. E. C. Pendleton and U. R. Harris. There are at present in the chronometer room 233 chronometers, of which 22 are ready for issue, 21 are on trial, 71 require repairs, and will be repaired as wanted for issue, and 119 are condemned, to be used only as "hacks."

During the year 53 have been received from naval vessels and other sources of service; 41 have been issued to naval vessels, Transit of Venus Commission, South Pacific Eclipse Expedition, and for other service; 49 have been cleaned and repaired, and there are now 24 undergoing repairs at the establishments of Messrs. Negus in New York, and Messrs. Bond in Boston. Two new chronometers have been received from Messrs. Bond, and are now on trial, preparatory to exchange for old ones of their manufacture, on passing the required trial.

A temperature room has been constructed for the more perfect testing of chronometers, and the Observatory is now prepared to test them

at any temperature to which they will be subjected in their practical uses. A proposition was made to the chronometer makers each to place four chronometers at the Observatory for a competitive trial beginning January 1, 1884, the Bureau of Navigation to purchase the four passing the best trials. This has been accepted by William Bond & Son, Boston, T. S. & J. D. Negus, John Bliss & Co., and D. Eggert's Sons, of New York. By this method of purchasing the best American-made chronometers will be obtained.

TRANSMISSION OF TIME-SIGNALS.

This work is in charge of the officers having the care of the chronometers. The time continues to be sent over the wires of the Western Union Telegraph Company, and time-balls to be dropped at New York and Washington, as stated in last report. This work is all done automatically by direct connection with the Observatory clock. The New York ball has occasionally failed to drop, owing to interruptions along the wires, entirely beyond the control of the Observatory. The Observatory ball has failed three times during the year; once, owing to high wind, it could not be hoisted; once the electric connections were broken by ice; and once by a failure to make the proper connections.

The fire-alarm bells continue to be struck, and the time to be given to the horological establishments of the city at 6 a. m., 12 m., and 6 p. m.

EXAMINATION OF NAUTICAL INSTRUMENTS.

This work is in charge of Lieut. W. E. Sewell. One hundred and twenty-one sextants and octants have been received at the Observatory for examination. Forty-six of this number have been found in good order. Their errors of eccentricity and graduation have been determined, and a table of corrections for each has been placed in its box. These instruments have been returned to the navy-yards, and are now ready for issue. There are remaining on hand at the Observatory seventy-seven instruments, ten of which may be made serviceable by repairs; the remainder have serious defects which will render most of them worthless. The principal of these defects are bent arcs or bent pivots. Another very common defect is want of parallelism in the glasses. Few of the makers seem to have exercised much care in this respect.

The sextants and octants made by Stackpole & Brother, of New York, are superior to all others. The shades of five artificial horizons have been tested for parallelism of the glasses, and three were found defective, changing the direction of the rays from one to two and a half minutes. Two standard thermometers, made for the Observatory by J. & H. J. Green, of New York, have been tested for their freezing and boiling points, and their tubes calibrated. At no point was the error found to be greater than one-fifteenth of a degree. Tables of corrections for 45 clinical thermometers have been made for the Marine Hospital Service.

THE LIBRARY.

The library now contains nearly 12,000 volumes, including 275 now at the Government Bindery. The works on astronomy, mathematics, and navigation are particularly numerous and well selected, making this library one of the most complete on these subjects in this country.

It is also rich in works on physics, geography, meteorology, &c., and proceedings and transactions of scientific and other learned societies both at home and abroad. It is fast outgrowing its present accommodations, it being necessary to keep a large number of books in very inconvenient places outside of the library proper.

During the year 805 volumes have been added by purchase, 258 received by exchange, 113 by gifts, and 246 public documents, Department reports, &c., making the accession aggregate 1,602 volumes, besides a large number of pamphlets.

The annual volume of Astronomical and Meteorological Observations for 1879 has been recently received from the Public Printer, and the copies are now being sent out. The demand for these volumes is very great, there being 600 addresses on our regular list, which includes all the principal scientific and other learned institutions in this and foreign countries, as well as important libraries, and private individuals particularly interested in astronomical and meteorological researches.

The printing of the volume for 1880 will probably be finished by the 1st January next, while the manuscript for the volume for 1881 is nearly ready for the printer. The printing of the annual volume is falling behind from year to year, and, with the apparently necessary expenditure of the printing fund at the disposal of the Navy Department, this seems inevitable. The Department fund is usually exhausted by the last of April, and then we lose two months' time. If there were a fund at the sole disposal of the Observatory, this difficulty could be overcome. I therefore urge that Congress be asked to appropriate \$7,000 annually for printing the Observatory volumes, until the back work can be brought up, as near as practicable, to date. The manuscript, consisting of 875 pages, for a complete catalogue of the books and pamphlets in the library July 1, 1883, alphabetically arranged by authors and subjects, is now ready for printing.

UNITED STATES ASTRONOMICAL EXPEDITION TO CHILE.

Prof. William Harkness, assisted by Mr. Emil Wiessner, has made progress in reducing the zone observations made in Chile during the years 1850, 1851, and 1852 by the expedition under the late Capt. J. M. Gilliss, U. S. N. The reduction of these zones is now so far advanced that a card catalogue of all the stars has been formed, each star occupying a single card. The total number of stars is about 17,000. They have all been examined for accidental errors, and the systematic corrections peculiar to each zone have been computed and applied up to November 1, 1850. On June 30, 1883, the appropriation from which Mr. Weissner was paid became exhausted, and the work ceased. About \$1,000 are needed to finish the preparation of the star catalogue from these zones, and it is hoped that Congress will grant that sum at its next session.

TRANSIT OF VENUS, DECEMBER 6, 1882.

Everything relating to the organization of the Transit of Venus parties was confided by the law to the Transit of Venus Commission, but as most of the executive work has been done at the Naval Observatory, it may be proper to refer to it here. In the beginning of 1882 the instruments used in 1874 were examined and repaired, all necessary changes being made in them, and some new instruments were purchased. At a very early stage of its deliberations the Commission decided to rely

mainly upon the photographic method of observing; and to ascertain the most suitable kind of emulsion, an extensive series of experiments was made by Mr. Joseph A. Rogers, who has prepared all the emulsion needed for the various parties. The number of parties organized was the same as in 1874, namely, eight, of which four remained in the United States, and four were sent to the Southern Hemisphere.

The U. S. S. Brooklyn was specially detailed to carry Lieutenant Very and his party from Montevideo to their station in Patagonia; but with that exception, only the ordinary public modes of conveyance were used in the transportation of the parties. The operations of those at foreign stations were much facilitated, and their comfort greatly enhanced by the numerous courtesies extended to them by the Governments of the countries in which they were located.

The names of the persons comprising the various parties, and the stations at which they observed, are as follows:

HOME STATIONS.

U. S. Naval Observatory, Washington, D. C.

Prof. Wm. Harkness, U. S. N., chief astronomer.
Mr. Joseph A. Rogers, Washington, D. C., assistant.
Prof. A. H. Buchanan, Lebanon, Tenn., assistant.
Lieut. Commander C. H. Davis, U. S. N., assistant.

Cedar Keys, Fla.

Prof. J. R. Eastman, U. S. N., chief astronomer.
Lieut. John A. Norris, U. S. N., assistant astronomer.
Mr. George Prince, photographer Treasury Department, photographer.
Mr. George F. Maxwell, Washington, D. C., assistant photographer.

San Antonio, Tex.

Prof. Asaph Hall, U. S. N., chief astronomer.
Mr. R. S. Woodward, Detroit, Mich., assistant astronomer.
Mr. D. R. Holmes, Milford, Del., photographer.
Mr. George H. Hurlbut, Belvidere, Ill., assistant photographer.

Cerro Roblero, N. Mex.

Prof. George Davidson, United States Coast and Geodetic Survey, chief astronomer.

Mr. J. S. Lawson, United States Coast and Geodetic Survey, assistant astronomer.

Mr. J. F. Pratt, United States Coast and Geodetic Survey, second assistant astronomer.

Mr. D. C. Chapman, United States Coast and Geodetic Survey, photographer.

Mr. T. S. Tappan, Bellaire, Ohio, assistant photographer.

FOREIGN STATIONS.

Wellington, South Africa.

Prof. Simon Newcomb, U. S. N., chief astronomer.
Lieut. Thomas L. Casey, jr., U. S. A., assistant astronomer.

Ensign J. H. L. Holcombe, U. S. N., additional assistant astronomer.
Mr. Julius Ulke, Washington, D. C., photographer.

Santa Cruz, Patagonia.

Lieut. Samuel W. Very, U. S. N., chief astronomer.
Mr. O. B. Wheeler, Detroit, Mich., assistant astronomer.
Mr. William Bell, Philadelphia, Pa., photographer.
Mr. Irvin Stanley, Indianapolis, Ind., assistant photographer.

Santiago de Chile.

Prof. Lewis Boss, Albany, N. Y., chief astronomer.
Mr. Miles Rock, Naval Observatory, Washington, D. C., assistant astronomer.
Mr. Theodore C. Marceau, Washington, D. C., photographer.
Mr. Charles S. Cudlip, Washington, D. C., assistant photographer.

Auckland, New Zealand.

Mr. Edwin Smith, United States Coast and Geodetic Survey, chief astronomer.
Prof. H. S. Pritchett, Saint Louis, Mo., assistant astronomer.
Mr. Augustus Story, Boston, Mass., photographer.
Mr. Gustav Theilkuhl, Washington, D. C., assistant photographer.

In addition to these parties, which were entirely fitted out by the Transit of Venus Commission, there was another at Princeton, N. J., under the direction of Prof. C. A. Young, assisted by Prof. C. F. Brackett, Prof. William Libbey, jr., Mr. Henry Crew, Mr. W. F. Magie, Mr. F. Fisher, Mr. F. A. Young, and Mr. McNeill. For this station, only the glass plates and emulsion were furnished by the Transit of Venus Commission. All the instruments and apparatus employed are the property of Princeton College, but as the photoheliograph is an exact duplicate of those furnished to the Government parties, and was used in the same way, all the pictures taken by it are strictly comparable with those obtained at the other stations, and Professor Young has kindly given them to the Transit of Venus Commission for reduction and discussion.

A station was also established at the Lick Observatory, Mount Hamilton, Cal., by the trustees of The James Lick Trust. The horizontal photoheliograph there employed was similar in all essential parts to those used at the Government stations; and, in compliance with the request of Capt. R. S. Floyd, president of Lick trustees, the operations with it were directed by Prof. D. P. Todd, of Amherst College. So far as possible, everything was done in strict accordance with the instructions issued for the guidance of the Government parties, and 123 photographs of the transit were obtained, nearly all of which are believed to be measurable. The Lick trustees have kindly lent these negatives to the Commission for measurement and discussion, and the results from them will appear in the Government reports.

On the day of the transit the sky was perfectly clear at about half the stations, while at the remainder clouds impeded the work more or less, but nowhere to the extent of producing failure.

The results obtained by the different parties are as follows:

Stations.	Photograph plates.		Contacts observed.			
	Exposed.	Measurable.	First.	Second.	Third.	Fourth.
Washington, D. C	53	49	.....	.....	.....	.....
Prof. William Harkness .....	.....	.....	.....	1	1	.....
Commander W. T. Sampson .....	.....	.....	1	1	1	1
Prof. E. Frisby .....	.....	.....	1	1	1	1
Ensign S. J. Brown .....	.....	.....	.....	.....	1	1
Mr. Joseph A. Rogers .....	.....	.....	.....	1	1	1
Cedar Keys, Fla	176	165	.....	.....	.....	.....
Prof. J. R. Eastman .....	.....	.....	.....	1	1	1
San Antonio, Tex	204	121	.....	.....	.....	.....
Prof. A. Hall .....	.....	.....	.....	.....	1	1
Rev. Dr. Richardson .....	.....	.....	.....	.....	1	1
Capt. W. R. Livermore .....	.....	.....	.....	.....	1	.....
Cerro Roblero, N. Mex	216	216	.....	.....	.....	.....
Prof. George Davidson .....	.....	.....	1	1	1	1
Mr. J. S. Lawson .....	.....	.....	1	1	.....	.....
Mr. J. F. Pratt .....	.....	.....	.....	.....	1	1
Princeton, N. J	190	127	.....	.....	.....	.....
Lick Observatory, California	123	115	.....	.....	.....	.....
Total for Northern Hemisphere	962	793	4	7	11	9
Wellington, South Africa	236	200	.....	.....	.....	.....
Prof. S. Newcomb .....	.....	.....	1	1	.....	.....
Lieut. T. L. Casey .....	.....	.....	1	1	.....	.....
Ensign J. H. L. Holcombe .....	.....	.....	1	1	.....	.....
Miss M. E. Cummings .....	.....	.....	1	1	.....	.....
Miss A. P. Ferguson .....	.....	.....	1	1	.....	.....
Miss J. N. Brown .....	.....	.....	1	1	.....	.....
Santa Cruz, Patagonia	224	204	.....	.....	.....	.....
Lieut. S. W. Very .....	.....	.....	1	1	1	1
Mr. O. B. Wheeler .....	.....	.....	1	1	1	1
Santiago de Chile	204	152	.....	.....	.....	.....
Prof. Lewis Boss .....	.....	.....	1	1	1	1
Mr. Miles Rock .....	.....	.....	1	1	1	1
Auckland, New Zealand	74	31	.....	.....	.....	.....
Mr. Edwin Smith .....	.....	.....	.....	.....	.....	1
Prof. H. S. Pritchett .....	.....	.....	.....	.....	1	1
Mr. J. J. Stevenson .....	.....	.....	.....	.....	1	1
Total for Southern Hemisphere	738	587	10	10	6	7
Total for both hemispheres	1,700	1,380	14	17	17	16

On March 1 Mr. Joseph A. Rogers resigned his position as chief photographer to the Commission in order to accept a more lucrative position in Philadelphia. The Commission felt much regret at parting with him, and some experiments having an important bearing on astronomical photography which he was carrying out are yet incomplete. On April 1 the Commission secured the services of Mr. R. S. Woodward to assist in the reduction of the transit observations, and on July 1 Messrs. A. S. Flint, Emil Wiessner, and A. Hall, jr., were employed for the same purpose. Prof. H. M. Paul was temporarily employed during the month of October, 1883. Under the direction of Prof. William Harkness these gentlemen have read all the measurable negatives obtained at Washington, Cedar Keys, and San Antonio, and are now engaged on the Cerro Roblero negatives. Considerable progress has also been made in the reductions based upon these measurements. It is believed that the solar parallax yielded by the transits of 1874 and 1882 must depend principally upon the photographs; and when it is remembered that only 221 measurable negatives were obtained in 1874, the remarkable success of the operations of last De-

cember will be apparent. If no unforeseen delay occurs, probably the definitive result from the photographs of both transits can be arrived at in about four years

Printed instructions for making optical observations of the transit were extensively distributed to persons known to be interested in astronomy, and the Western Union Telegraph Company generously undertook to furnish the noon time-signals from the Naval Observatory to all intending observers who might apply for them anywhere within the United States on December 4, 5, 6, and 7. These facilities resulted in bringing nearly every telescope in the country into action; and notwithstanding the bad weather which prevailed in many places, the Transit of Venus Commission has received ninety-three reports from persons located within the United States.

Increased estimates have been submitted for the coming year. The reasons for such increase are explained in each case in my letter accompanying the estimates.

My experience suggests that the efficiency of the Observatory would be increased by the appointment of a Board of Visitors, to consist of a limited number of distinguished astronomers, whose duty it would be annually to examine into the working of the Observatory, and report to the Secretary of the Navy. They should have power to advise with the Superintendent as to the character of the work to be done at the Observatory.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, Superintendent.

Commodore J. G. WALKER, U. S. N.,
Chief of Bureau of Navigation, Navy Department.

UNITED STATES NAVAL OBSERVATORY,
Washington, September 24, 1883.

SIR: I respectfully request that Congress be asked to appropriate the sum of \$586,138 for the purpose of erecting a new Observatory upon the site purchased under the act of Congress approved February 4, 1880.

The amount asked for is to cover the expense of constructing roads, grading, erecting the Observatory buildings, and quarters for the Superintendent, the observers, and others whose duties require them to be in attendance during the night; for fencing, for moving the instruments and erecting them in the new building, and for all the expenses whatever.

Plans of the building were made two years ago, and photographs of them were submitted to all the leading scientific gentlemen of the country for their opinion and criticism. These opinions led to some slight alterations in the plans, though the opinions in all cases were most favorable.

The plans were finally approved by the Commission appointed under the act mentioned above.

The unsuitableness of the present situation for astronomical purposes renders it desirable to make the change as early as possible. I append hereto, as bearing upon this subject, a copy of a letter from the Super-

vising Architect of the Treasury, written in April, 1882, to the chairman of the House Committee on Appropriations.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, Superintendent.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy, Washington, D. C.

Respectfully recommended and forwarded.

J. G. WALKER,
Chief of Bureau.

TREASURY DEPARTMENT,
OFFICE OF THE SUPERVISING ARCHITECT,
April 22, 1882.

SIR: In compliance with the request of your committee, conveyed by letter of the 12th instant, I have examined the plans and specifications for the proposed building for the Naval Observatory.

The present buildings are old and dilapidated, and the interests of the public service require that the new building should be erected as speedily as possible. I estimate that the lowest amount that would reasonably serve for the first year's work would be about one half of the amount proposed to be appropriated, say \$275,000. I think, however, the Government interests would be best served by an appropriation of the entire amount estimated for the work.

Very respectfully,

JAS. G. HILL,
Supervising Architect.

Hon. FRANK HISCOCK,
Chairman Committee on Appropriations, House of Representatives..

UNITED STATES NAVAL OBSERVATORY,
Washington, October 26, 1883.

SIR: Your earnest attention to the concluding portion of the annual report of the Observatory is respectfully requested. It is therein recommended that a Board of Visitors, to consist of a limited number of eminent astronomers, be appointed to inspect annually the work of the Observatory, and report to the Secretary of the Navy. Their principal duty would consist in advising with the Superintendent upon the scientific portion of his duties, and in enabling him to decide upon the character of the work to be done. Such a Board might be appointed to serve for a number of years as a Board of Council, or they might be appointed annually.

It is hoped that a Board, wisely selected, would remove, by the weight of their scientific authority, many of the objections which are now urged against the administration of the Observatory.

Very respectfully,

R. W. SHUFELDT,
Rear-Admiral, Superintendent.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy, Washington, D. C.

Respectfully forwarded.

J. G. WALKER,
Chief of Bureau.

NAUTICAL ALMANAC OFFICE, BUREAU OF NAVIGATION,
Washington, D. C., October 25, 1883.

SIR: I have the honor to submit the following report of the operations of this office during the past year:

Printing.—The American Nautical Almanac for the year 1886 was issued from the press in November, 1882, and the large Ephemeris for the same year in May, 1883.

Of the Almanac and Ephemeris for 1887 the greater part is in type, and the printing and computations are all up to or ahead of time.

Sale and distribution.—During the fiscal year ending June 30, 1883, 511 copies of the large Ephemeris were sold, and 765 distributed for the public service and for scientific and educational purposes.

During the thirty-three years which have elapsed since the establishment of the work, a constantly increasing number of odd copies for past years have accumulated. The surplus copies, to the number of 2,329, have, during the year, been distributed to institutions of learning not previously supplied, but a reserve of 40 copies for each year, to complete sets in the future, has, so far as practicable, been retained.

Of the Navigator's Almanac, 2,034 copies were sold. The number sold at each agency is as follows:

Boston.....	346
New York.....	865
Philadelphia.....	390
Baltimore.....	36
Charleston.....	14
New Orleans.....	48
San Francisco.....	271
Portland, Oreg.....	64
Total.....	2,034

This statement, compared with those of previous years, shows a steady falling off in the sales. This is attributed by the agents to the gradual diminution in the number of American ships engaged in foreign trade. But it is believed that the falling off is accelerated by the almost universal custom among the large dealers of publishing private Nautical Almanacs of their own for the use of coasting vessels. These publications contain, of astronomical matter, only what is essential to a vessel which depends entirely on observations of the sun for its position. But they include list of light-houses, tide-tables, and various other matters supposed to be useful to the mariner, including sometimes tables and directions designed to dispense with the use of a book on navigation. These publications, it is believed, are issued more for advertising purposes than for the profits on sales. They are sometimes sold at the price of twenty-five cents, and sometimes given away. They are preferred to the Government publications by a large number of coasters, not only on account of their cheapness, but because they give in one compact pamphlet a collection of information which can be obtained from Government publications only in a much more bulky and expensive form. Under these circumstances, it seems worthy of consideration whether the office should not issue an almanac especially for coasting vessels, comprising such information respecting light-houses, tides, and other matters as can be compressed into a single cheap volume.

The current work upon the annual Ephemeris continues in its forward state. The computations for 1887 are substantially completed, and are undergoing examination as sent to the press. The computations for 1888 are in progress, and those on the sun and moon for 1889 are commenced, in order to be ready for the computers who are to continue the

work the next fiscal year. The completion of any one volume thus occupies three fiscal years, the first being occupied with the preliminary computations, which have to be made in advance, the second with the completion of the computations, and the third with their examination and printing.

ASTRONOMICAL RESEARCHES.

In previous annual reports I have spoken of the work undertaken by the office of correcting and unifying the constants of astronomy, and preparing data for planetary tables which shall be free from the confusion now existing in such tables. The ultimate result of this work will, it is hoped, be the construction of tables sufficiently accurate to satisfy most of the wants of astronomy for nearly a century to come, and founded on such uniform data that the labor of correcting them will not be great. The following are the principal works on which progress has been made during the year:

Transits of Mercury.—The discussion of all observed transits of Mercury since 1677, the conclusion of which was announced in my last Annual Report, has been printed and distributed.

Transits of Venus.—An essential part of this work will be the discussion of past and recent transits of Venus. Advantage has been taken by the Superintendent of a visit to the leading astronomical institutions of Europe to make a collection of such observations of older transits as are not accessible in this country. Work on this discussion has not yet been commenced.

Theories of Mercury, Venus, and Mars.—The computations necessary to compare the tables of these planets with observations since 1750 have made good progress, but no definitive result is yet reached.

Reduction of Greenwich observations.—Professor Safford's work on the corrections to be applied to the Greenwich observations between 1767 and 1815 has been received and sent to the printer. It embodies the tables necessary to reduce these results with modern data.

Reduction of occultations.—The reduction of the principal series of occultations of stars by the moon since 1750 has made good progress, and the heavy work of computation is nearly complete. It is, however, contemplated to add to the work by employing a great number of additional observations, both old and recent. It is also desirable that the discussion of solar eclipses should be included, but this has not yet been undertaken.

An arrangement has been made with Dr. David Gill, Her Majesty's astronomer at the Cape of Good Hope, for the incorporation with this work of a long and valuable series of occultations observed at that institution. In return he has been supplied by the office with the places of the moon to be used in the reductions.

Mutual perturbations of the planets.—The mathematical computations necessary for new tables of planetary perturbations have been commenced. The preliminary computations were made by Lieutenant Sturdy, and the subsequent work, which is to be done in duplicate, is being executed by Mr. Corrigan and Mr. Prentiss.

Jupiter and Saturn.—Mr. Hill has pushed forward his work on the perturbations of these two planets during the entire year, but finds that to secure the degree of accuracy which is necessary to give the result a permanent value a far greater amount of computation is necessary than was originally anticipated. He estimates that more than a year will still be required for its completion.

Velocity of light.—The observations and experiments for determining

the velocity of light were completed in September, 1882, but owing to the absence of the Superintendent the work of discussing them has been arrested. It will now be completed as soon as practicable.

During the period from September 18, 1882, until September 7, 1883, the Superintendent was absent, first in charge of an expedition to observe the transit of Venus at the Cape of Good Hope, and then in visiting the observatories and libraries of Europe for scientific information. A special report will be submitted upon the results of this journey.

During this interval the affairs of the office were conducted by Lieut. E. W. Sturdy, U. S. N., with the aid of memoranda and instructions sent from time to time by the Superintendent. I beg leave to call the attention of the Bureau to the highly satisfactory manner in which Lieutenant Sturdy performed the duties, sometimes delicate and difficult, which thus devolved upon him.

I also deem it proper, in conclusion, to call attention to the gradually increasing efficiency of the office force, and to the high standard of qualification required in much of its work. At least half the assistants are required to possess the best mathematical training which the country can afford, and among the past and present assistants are no inconsiderable number of men whose names are known and honored in both hemispheres.

Very respectfully, your obedient servant,

SIMON NEWCOMB,

Superintendent Nautical Almanac Office.

Commodore J. G. WALKER, U. S. N.,

Chief Bureau of Navigation, Navy Department.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Navigation.*

A.

FOR THE SUPPORT OF THE BUREAU OF NAVIGATION.

I.—SALARIES.

For salary of chief clerk (Revised Statutes, page 70, section 416, and act of March 3, 1883)	\$1, 800
For salary of two clerks of third class (Revised Statutes, page 27, section 167, and act of March 3, 1883).....	3, 200
For salary of one clerk of second class (Revised Statutes, page 27, section 167, and act of March 3, 1883).....	1, 400
For salary of two clerks of first class (Revised Statutes, page 27, section 167, and act of March 3, 1883).....	2, 400
For salary of one copyist (Revised Statutes, page 27, section 167, and act of March 3, 1883).....	900
For salary of one assistant messenger (Revised Statutes, page 27, section 167, and act of March 3, 1883).....	720
For salary of two laborers (Revised Statutes, page 27, section 169, and act of March 3, 1883)	1, 320
Total	11, 740

NOTE.—It is recommended that, in place of one clerk of third class, two of second class, one of first class, and one at \$1,000, there be allowed two clerks of third class, one of second class, and two of first class.

II.—CONTINGENT, BUREAU OF NAVIGATION.

For contingent expenses (act of March 3, 1883).....	\$800
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B.

NAVAL WAR RECORDS.

For collating and copying the Naval War Records:

For salary of one clerk of first class	\$1, 200
For salary of one clerk	1, 000
For salary of three copyists.....	2, 700
Total.....	4, 900

C.

DEPARTMENT LIBRARY.

For books for Department library (act of March 3, 1883)	\$5, 000
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D.

I.—SALARIES, HYDROGRAPHIC OFFICE.

For chief of engraving and drafting, \$2,400; two clerks of second class, one assistant messenger, and one office attendant at \$420 (act of March 3, 1883)	\$6, 340
For draftsmen, engravers, copyists, copper-plate printers, printer's apprentices, and laborers in the Hydrographic Office (act of March 3, 1883)	32, 660
For one electrician	1, 500
Total.....	40, 500

II.—MISCELLANEOUS EXPENSES, HYDROGRAPHIC OFFICE.

For purchase of chart paper, copper plates, printing material, foreign hydrographic works, photolithographing charts, repairs to printing presses, and engraving and drawing outside of Hydrographic Office (act of March 3, 1883)	\$25, 000
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III.—CONTINGENT, HYDROGRAPHIC OFFICE.

For purchase of books, office furniture, drawing materials, and other stationery, postage, freight, and other contingent expenses.....	\$3, 000
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IV.—ELECTROTYPING COPPER PLATES.

For electrotyping copper plates on hand.....	\$5, 000
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V.—NEW EDITION MAURY'S CHARTS.

For new edition of Maury's Wind and Current Charts.....	\$10, 000
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VI.—COPPER PLATES.

For continuing the transfer to copper plates of photolithographic charts....	\$15, 000
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E.

I.—SALARIES, NAVAL OBSERVATORY.

For one assistant astronomer (act of March 3, 1883).....	\$1, 900
For two assistant astronomers at \$1, 700, increase of \$200 each, submitted (act of March 3, 1883)	3, 400
For one clerk of fourth class (act of March 3, 1883)	1, 800
For one instrument-maker, increase of \$200, submitted (act of March 3, 1883)	1, 700
For three computers, at \$1,200	3, 600
For four watchmen, including one for new Naval Observatory site (act of March 3, 1883)	2, 880
For one skilled laborer (act of March 3, 1883)	1, 000
For one skilled laborer (act of March 3, 1883)	720
For seven laborers, at \$660 (act of March 3, 1883)	4, 620
Total	\$21, 620

II.—CONTINGENT AND MISCELLANEOUS EXPENSES, NAVAL OBSERVATORY.

For miscellaneous computations (act of March 3, 1883)	\$1, 200
For purchase of professional books and periodicals for the library (act of March 3, 1883)	1, 000
For purchase of apparatus and material for repairs of instruments (act of March 3, 1883)	2, 500
For repairs to buildings, for fuel, furniture, gas, chemicals, stationery, freight, postage, and all contingent expenses (act of March 3, 1883)	4, 500
For payment to Smithsonian Institution for freight on publications of Observatory sent to foreign countries (act of March 3, 1883)	336
For fence to inclose grounds on north side	1, 000
For apparatus for setting clock used in transmitting time signals	300
For gas-engine for moving dome of large telescope	500
For outfit for lighting buildings by electricity	3, 000
For one transit circle	8, 000
Total	22, 336

III.—OBSERVATIONS, TRANSIT OF VENUS.

For completing reductions of the observations of transit of Venus (to be expended under direction of Transit of Venus Commission)	\$5, 000
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F.

I.—SALARIES, NAUTICAL ALMANAC OFFICE.

For salaries of assistants in preparing for publication the American Ephemeris and Nautical Almanac, viz:	
Three assistants, at \$1,600 each (act of March 3, 1883)	\$4, 800
Two assistants, at \$1,400 each (act of March 3, 1883)	2, 800
Three assistants, at \$1,200 each (act of March 3, 1883)	3, 600
Two assistants, at \$1,000 each (act of March 3, 1883)	2, 000
*One copyist (act of March 3, 1883)	900
One assistant messenger (act of March 3, 1883)	720
One laborer	660
	15, 480

II.—CONTINGENT AND MISCELLANEOUS EXPENSES, NAUTICAL ALMANAC OFFICE.

For pay of computers on piece-work in preparing for publication the American Ephemeris and Nautical Almanac, and improving the tables of the planets (act of March 3, 1883)	\$8, 400
For stationery, boxes, expressage, books, and miscellaneous items (act of March 3, 1883)	400
Total	8, 800

FOR THE NAVAL SERVICE.

I.—NAVIGATION.

For foreign and local pilotage and towage of ships of war; services and materials in correcting compasses on board ship, and for adjusting and testing compasses on shore; nautical and astronomical instruments, nautical books, maps, charts, and sailing directions, and repairs of nautical instruments for ships of war; books for libraries for ships of war; naval signals and apparatus, namely: signal-lights, lanterns, rockets, running lights, drawings and engravings for signal-books; compass-fittings, including binnacles, tripods, and other appendages of ship's compasses; logs and other appliances for measuring the ship's way, and leads and other appliances for sounding; lanterns and lamps and their appendages for general use on board ship, including those for the cabin, ward-room, and steerage, for the holds and spirit-room, for decks and quartermaster's use; bunting and other materials for flags, and making and repairing flags of all kinds; oil for ships of war other than that used in the engineer department, candles, when used as a substitute for oil in binnacles and running lights, chimneys and wicks, and soap used in the navigation department; stationery for commanders and navigators of vessels of war, and for use of courts-martial; musical instruments and music for vessels of war; steering-signals and indicators, and speaking tubes and gongs for signal communication on board vessels of war; and for introducing electric lights on board vessels of war (act of March 3, 1883)	\$130, 000
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*Increase of \$420 (submitted). The copyist performs also the duties of stenographer.

II.—OUTFIT OF CRUISERS AND MONITORS.

For the navigation outfits of the four new cruisers and of five monitors authorized by Congress \$60,000

III.—OCEAN SURVEYS.

For special ocean surveys and the publication thereof (act of March 3, 1883). \$20,000

IV.—COMPASS TESTING HOUSE.

For the erection of a compass testing house \$7,000

V.—PROFESSIONAL PAPERS.

For the publication of professional papers \$12,000

VI.—CONTINGENT, NAVIGATION.

For contingent expenses of the Bureau of Navigation, namely: for freight and transportation of navigation materials; postage and telegraphing on public business; advertising for proposals; packing-boxes and materials, and all other contingent expenses (act of March 3, 1883)..... \$4,000

VII.—CIVIL ESTABLISHMENT, NAVIGATION.

For the civil establishment at navy yards and stations (act of March 3, 1883). \$6,000

RECAPITULATION.

A.—I. Salaries, Bureau of Navigation.....	\$11,740
II. Contingent, Bureau of Navigation	800
B. Naval War Records.....	4,900
C. Department Library	5,000
D.—I. Salaries, Hydrographic Office	40,500
II. Miscellaneous expenses, Hydrographic Office	25,000
III. Contingent, Hydrographic Office.....	3,000
IV. Electrotyping copper plates.....	5,000
V. New edition Maury's Charts	10,000
VI. Copper plates	15,000
E.—I. Salaries, Naval Observatory	21,620
II. Contingent and miscellaneous expenses, Naval Observatory	22,336
III. Observations, transit of Venus.....	5,000
F.—I. Salaries, Nautical Almanac Office	15,480
II. Contingent and miscellaneous expenses, Nautical Almanac Office	8,800
Total	194,176

FOR THE NAVAL SERVICE.

I. Navigation	\$130,000
II. Outfit of cruisers and monitors	60,000
III. Ocean surveys	20,000
IV. Compass testing house	7,000
V. Professional papers.....	12,000
VI. Contingent, navigation	4,000
VII. Civil establishment, navigation	6,000
Total	239,000

No. 14.—BUREAU OF CONSTRUCTION AND REPAIR.

NAVY DEPARTMENT,
BUREAU OF CONSTRUCTION AND REPAIR,
Washington, November 1, 1883.

SIR: In obedience to the Department's order of the 13th of October, ultimo, I have the honor to submit my annual report for the fiscal year ended June 30, 1883, showing work performed and amounts expended, with an estimate of amount required for the purposes of this Bureau for the fiscal year ending June 30, 1885.

The estimates of the expenses of this Bureau, as given in the statement marked A, are in accordance with existing laws.

The estimate for the pay of clerks and writers at the several navy-yards, in the tabular statement marked E, is for services which cannot be dispensed with if the work under this Bureau is to be performed with the same system and correctness as heretofore.

The amount of work doing in the navy-yards does not affect this question. Each and every clerk and writer has specific duties to perform. The same number of reports and blanks is required to be filled up and sent to the Bureau for its information, without regard to the quantity of work on hand.

The estimate marked B is for the general repairs of vessels at navy-yards and on foreign stations; purchase of stores, materials, and tools of all kinds; preservation of materials and stores, and for the general care and protection of the Navy, in the line of construction and repair, &c.

The sum of \$400,000 is required to complete the frigate New York, at the navy-yard, Brooklyn, and the Mohican, at the navy-yard, Mare Island, California. A recommendation was made in my last annual report to complete these vessels, but no special appropriation was made for this purpose. The sum of \$100,000 was set aside from the appropriation for the fiscal year ending June 30, 1884, for labor and materials for the Mohican, and it is expected that she will be launched by January, 1884; but an additional sum will be required to fit her for sea. This vessel would probably have not been in condition to finish had she remained on the stocks another year; consequently, it was thought best to push her to completion as far as possible this year, and ask for an additional amount to finish her, when the Department would have another available vessel (of the Marion class) for service during the next ensuing fiscal year—a class of vessel that has proved entirely successful and satisfactory in every respect, except that of armament, the guns carried being of little or no account. This vessel is 216 feet between perpendiculars, 38 feet breadth of beam, ship-rigged, having a sail surface of 14,150 square feet in her ten principal sails. Like other vessels of her class, she can carry an armament consisting of one 8-inch rifle (muzzle-loader), six 9-inch, one 60-pounder, or its equivalent weight in modern breech-loading rifled guns. Her draught of water, when ready for sea, is

intended to be 14 feet 6 inches forward, and 17 feet 6 inches aft, and, at this draught, her displacement will be 1,900 tons.

The New York was designed, and put in frame, by Naval Constructor B. F. Delano, U. S. N. (deceased), in 1865. She is a very fine model, and has a live-oak frame that, from its age and the care taken of it, is in an excellent state of preservation. She is 315 feet on the mean load line, 354 feet over all, 47 feet extreme breadth of beam, 25 feet 11 inches depth from lower edge of the rabbet of the keel to lowest port sill on gun-deck. She was designed to have a ship's rig, having 24,000 square feet of sail surface in her ten principal sails. Her armament could be made equal to the weight of two 100 and one 60-pounder Parrott rifles, and sixteen 9-inch smooth-bore guns. There is no reason why a battery cannot be arranged on this ship to have a direct bow and stern fire from half-turret guns on the spar-deck, and recessed ports on the gun-deck. With modern engines and boilers, the vessel could undoubtedly attain a 14-knot sea speed. Materials for steel boilers for the vessel were purchased last year, and the work on them, as I understand, is well under way in the steam engineering department of the Washington navy-yard.

The plan for completing the vessel can be finished in a short time, whenever the question of completing her is decided, and if the materials of planking, ceiling, decks, and, in fact, all the wood-work used in her, except joiner materials, are first impregnated by the Thilmany process for preserving ship timber, the vessel will be useful for the next twenty years, material so impregnated being thoroughly protected against worm and dry rot.

The displacement of the New York, at a draught of 18 feet 9 inches forward and 21 feet 5 inches aft, is 4,527 tons, and her lowest port-sill would be 8 feet above water.

During the past year the Bureau has taken care to use very little, if any, other than impregnated-wood materials in the work of repairing the Ossipee, Shenandoah, Trenton, and Omaha. Contracts have been made, and 160,000 cubic feet of yellow pine and other material have been impregnated during the past year by the American Wood Preserving Company's process at the navy-yard, Boston, Mass. There is little doubt, from all the information that can be gathered relative to it, that materials treated in this way are rendered secure from dry rot. Material so impregnated has been used extensively in naval vessels during the past five or six years, and the question of their better preservation thereby will be demonstrated upon the return of these ships to the United States from foreign stations. When the Trenton was built, Naval Constructor William L. Mintonye had a piece of wood taken from a green tree and impregnated. This was dressed and used in the port battery, aft of the quarter-gallery port. The vessel was absent from the United States for a period of five years, and on her return Constructor Mintonye carefully examined the piece he put in, which he found to be as *hard and sound* as possible, whilst all around, above and below it, the unimpregnated materials were badly dry rotted and had to be removed.

I am in favor of continuing the use of this process for the preservation of timber, and believe that all ship-timber should be contracted for, to be landed at the navy-yard, Boston, impregnated, and furnished on requisition to other yards when required. I do not, however, consider it to be to the best interest of the Government to contract, from time to time, for the impregnation of small quantities of material, and in the event of failure to keep the company supplied to run the hazard of be-

ing required to pay damages on account of such default. Congress, rather, should be asked to appropriate an amount sufficient to buy the works, which could be operated to advantage by the Bureau independent of the company, paying a reasonable and equitable royalty on the quantity of work done.

The amount appropriated, under construction and repair, for the current fiscal year, will, in my opinion, be entirely inadequate to carry on the work coming under the cognizance of the Bureau.

By the exercise of economy in buying such materials only as were necessary, I have succeeded in saving the sum of \$109,817.96 from the last fiscal year, when the appropriation was \$1,750,000. This amount should have been expended for materials to put in stock, but was deemed necessary to be used towards the building of the new steel vessels, under act approved August 5, 1882. In 1882, on assuming the duties of Chief of the Bureau, I found the navy-yards of the country almost entirely depleted of such materials as are indispensable for the usual repairs of vessels. In order to do the work a heavy expenditure was rendered necessary for labor and materials absolutely required for the work in hand, without being able to purchase any materials to keep in stock. The latter is essential in the case of wood materials, in order that they may be properly seasoned before using. The facts are that, independent of live-oak timber, there is not a navy-yard in the country to-day that has a sufficient stock of yellow and white pine, cedar, ash, walnut, or other timber and lumber material on hand for the complete repair of any one vessel, and whenever repairs are required and ordered the Bureau has to provide, not only the money to pay for the labor, but must buy the materials at open purchase from time to time as wanted. For the present fiscal year, when most of the work called for is of such a character as to require the purchase of all the materials before mentioned, including paints, oils, hardware, tools, &c., the appropriation is reduced to \$1,100,000, or \$440,182 less than was used last year by exercising the utmost economy.

The act approved March 3, 1883, which forbids the repair of any wooden vessel of the Navy costing more than 20 per cent. of the appraised value of a new ship of like size and materials, will, in the course of the next three years, largely reduce the number of wooden vessels now on the naval list (some of which we can ill afford to spare), and, in the course of the next five or six years, from natural causes, blot the remaining number of them almost, if not entirely, from the register. Although built of wood, their frames are of live-oak; very many of their models are as good as those of any vessel of their class in the world, but, after a cruise of from three to five years, they cannot, in the majority of cases, be repaired for one-fifth of the cost of a new ship of like size and materials, and, consequently, under the law must be abandoned.

The limit of repairs on all wooden vessels should, in my opinion, be fixed at $33\frac{1}{3}$ per cent. of the cost of a new vessel, of like size and materials, unless otherwise recommended by a competent board of officers, until such time as Congress, in its wisdom, may see fit to replace them by iron or steel vessels.

There might be good reasons for repairing a hull, with a good model and live-oak frame, where the engines, standing rigging, and most of the spars are good; but if new boilers are required, and even $33\frac{1}{3}$ per cent. repairs to the hull, the vessel should not be sacrificed, unless the Navy is in condition to afford it, by reason of having new vessels build-

ing better adapted to the wants of the service. Since the passage of this act, the repairs of the following-named vessels have had to be abandoned, with their consequent loss to the service: Alaska, Monongahela, Plymouth, and Ticonderoga. The Monongahela and Ticonderoga have live-oak frames, and could have been repaired for about 25 per cent. of the cost of new vessels of like size. The Alaska was, undoubtedly, unfit for repairs. The Plymouth, whose engines were good, but whose boilers needed repairs, had been hauled up in the ship-house at the Portsmouth, N. H., Navy-Yard. She could, and should now, be repaired, at an estimated cost of about 33 per cent. of the price of a new vessel. She is a fine model, and is one of a class that has had a good record and a successful career in the service. The Ticonderoga could be repaired for 25 per cent. of the cost of a new ship, possibly less, and should not be lost to the service. The Pensacola, now on her way home from the Pacific station, cannot, in my opinion, be repaired under this law; and it is very doubtful if the Richmond can be repaired, for the same reason, when she returns home after being relieved by the Trenton. The Minnesota, used as a training ship, cannot be repaired again, and the limit of her existence is, probably, eighteen months, if not less.

As the estimated cost for repairs of the Colorado is \$120,000, and of the Vermont \$9,821, the Department has approved the recommendation of the Bureau that the Vermont be immediately fitted as a receiving ship, in accordance with the report of the Board, and that materials of any kind from the Colorado that can be made use of be utilized in the execution of the work; that on the completion of it the Colorado be stripped of all materials that can be hereafter used in the repair of other vessels, and then placed in ordinary to be appraised and sold.

The Wabash, with a house over her, will last some years longer as a receiving ship.

The sheathing over the spar-deck of the Franklin, new covering of poop-deck with canvas, and building of houses over the hatches will render her efficient as a receiving ship at Norfolk for some time to come. I have doubts as to whether the Lackawanna can be repaired at the expiration of her present cruise under the present law. In less than three years the repairs that will be wanted on the Powhatan will be such as to necessitate condemning her under the present law. The frigate Constellation, used as a practice cruising ship for the cadets at the Naval Academy, is greatly in need of repairs, which the Board, ordered to survey her, estimate at \$65,739.41; this, in my opinion, will undoubtedly be exceeded, if the repairs are commenced, and I have been compelled to disapprove of its being done, as the amount that would be expended will, in my opinion, exceed the sum allowed by law, although the necessity of having such a vessel as this for the Naval School is very apparent.

The probable life of the Tennessee will not extend beyond twelve months, when she will be past repairing under the present law. Minor repairs have been made on the training vessels Saratoga, Portsmouth, and Jamestown, but the time is rapidly approaching when the work wanted on them will exceed the limit allowed by law, and they will have to be abandoned. Commodore Earl English, Chief of the Bureau of Equipment and Recruiting, in his annual report, will call your attention to these vessels, which are more particularly under his control; and, at his request, I have asked for a sufficient amount of money in my estimates to cover the labor of building two live-oak framed clipper barques for training vessels.

The appropriation for this Bureau, for the fiscal year ended June 30, 1883, was	\$1,750,000 00
Expended from July 1, 1882, to June 30, 1883:	
For labor at navy-yards.....	\$1,253,870 00
For materials, &c.....	386,312 04
	1,640,182 04
Balance on hand July 1, 1883.....	
	109,817 96

Vessels repaired at the different navy-yards during the fiscal year 1882-'83.

1ST RATE.	3D RATE.	4TH RATE.
Tennessee.	Alert.	Alarm.
	Adams.	Despatch.
2D RATE.	Alliance.	Tallapoosa.
	Enterprise.	
Alaska.	Juniata.	1ST RATE (used as receiving ships).
Omaha.	Kearsarge.	
Powhatan.	Mohican.	
Plymouth.	Nipsic.	Colorado.
Shenandoah.	Ossipee.	Franklin.
Trenton.	Ranger.	Wabash.
Vandalia.	Swatara.	
	Wachusett.	
	Yantic.	
SINGLE-TURRETED MONITORS.	TUGS.	SAILING VESSELS.
Montauk.	Catalpa.	Constitution.
Nantucket.	Cohasset.	Constellation.
Passaic.	Monterey.	Dale.
Wyandotte.	Pinta.	Jamestown.
	Phlox.	Portsmouth.
	Rescue.	Saratoga.
	Rocket.	

Agreeably to the suggestion, made in my last annual report, the double-turreted monitor Miantonomoh was loaded down to her deep-load draught, by placing on board the equivalent of all weights that she would carry when ready for sea, after which she made a very successful trip from League Island to the Washington navy-yard, making, as reported by her commanding officer, a speed of 10 knots with 65 revolutions of the screw and a steam pressure of 63 pounds, having steam up on six boilers only. She has, since then, made a good run to the New York navy-yard, where the work of altering her decks, &c., to receive the new roller base turrets, will soon be commenced, and the turret frames built, ready to receive the turret armor when the contractors deliver it.

Bids for the compound-turret armor were received from one firm only, namely, William H. Wallace & Co., of New York, who represent the Messrs. John Brown & Co., and Charles Cammell & Co., of Sheffield, England. They agree to deliver the turret armor in five months, and the pilot-house armor in ten months from the date of award of contract, which has been made.

The plans for the new turrets and alterations in the decks of the Miantonomoh are completed in detail, and, with the specifications for materials required for the work, are all ready, and will soon be sent to New York.

Since my last annual report the double-turreted monitor Puritan was launched from the ship-yard of John Roach & Son, at Chester, on December 6, 1882; the Terror, from the ship-yard of W. Cramp & Sons, Philadelphia, on March 24, 1883; the Amphitrite, from the ship-yard of

Harlan & Hollingsworth, at Wilmington, Del., on June 7, 1883; the Monadnock, from the yard of Burgess & Co., Vallejo, Cal., on September 19, 1883.

The plans for the alterations of the Intrepid (which was referred to in my last annual report) were referred by the Bureau to a Board at the New York navy-yard, consisting of Capt. E. E. Potter, Chief Engineer George W. Magee, Naval Constructor W. L. Mintonye, and Assistant Naval Constructors J. W. Hoover and Richard Gatewood. The Board unanimously approved the plans, with a few minor changes, and with the approval of the Department preparations are now making to haul out the vessel for the necessary alterations. This will give the service an effective gun-boat, for use in the Asiatic squadron, which now is practically useless for any purpose whatever.

During the civil war the Government had employed nearly the entire number of shipbuilding firms in the North, who, together with the navy-yards, employing nearly every available man, working nights and Sundays, using every available ship-house and slip, were not able to turn out work with the dispatch required. To-day our navy-yards are not in as good condition for doing work as when the war closed, while very many of the firms that were then among the most prominent shipbuilders of the country, more especially in New York and Brooklyn, have gone out of business and the yards no longer exist.

From wooden ships we have gone to iron and steel, with only a very few private firms in the country, who, in the event of war, could commence at once, and carry on, with any degree of rapidity, the building of iron and steel vessels of war.

This great nation should not close up any navy-yard, whether it be thought that there are too many of them to support in time of peace or not; but should, without further delay, place them all in such a condition of effectiveness that there would be ample facilities for building and repairing iron and steel ships in the event of war.

Tools and appliances for building such vessels cannot be manufactured or bought at short notice and fitted up for work; and it would be a late day to commence such work when war is declared. It has been customary for years past to rail against our navy-yards, their inadequacy for doing work, and the manner in which work is done in them; but facts speak for themselves.

The best work the Government has ever had has been done in its navy-yards. Quality is a prime factor in the matter of work, and much more so on an iron than on a wooden ship. It calls for the closest attention, the best professional talent to design and direct the execution of it; and this, it is supposed, the Government has at its command. The next thing, then, to do is to give its professional officers the tools and appliances to work with, and the vessels will be built, if money can be had to build them.

We shall want vessels very soon, as those we have are comparatively insignificant, and are fast disappearing. Nearly every civilized nation on the face of the earth is outstripping us in naval supremacy, and yet, in the face of all this, we are not only doing nothing towards putting our few navy-yards in condition for active service, should an emergency arise, but it is proposed absolutely to close some of them.

I sincerely trust that, if it shall be decided to close any of our navy-yards permanently, Congress, at least, will grant the money that I have asked for, to buy tools and put all the yards in condition for iron shipbuilding. To do this would not entail great expense in tools, as it is my opinion that with the present plant on hand for such purposes, and

an additional outlay of \$150,000, the navy-yards at Portsmouth, Boston, New York, League Island, Norfolk, Mare Island, and Pensacola could be put in condition to build any vessel that is now building, or any vessel that might be built hereafter.

The *Intrepid*, an iron-armored vessel of 1,150 tons displacement, was built in the Boston navy-yard in 1872, with the plant they then had.

In the New York yard, the *Alarm*, an iron-armored torpedo ram, was built in 1874. This yard has now a valuable lot of iron-shipbuilding tools.

In obedience to the Department's orders of the 21st and 24th of March, and of the 4th of April, 1883, the plans, specifications, &c., for the 4,500-ton steel cruiser *Chicago*, and the 3,000-ton steel cruisers *Boston* and *Atlanta*, were prepared and submitted for the approval of the Naval Advisory Board. The amount of money that will be required to finish these vessels, including the *Dolphin*, as well as the estimated cost for completing the double-turreted monitors *Puritan*, *Monadnock*, *Amphitrite*, and *Terror*, as estimated for by the Naval Advisory Board, is shown on exhibit marked C, hereto appended.

The steel lower masts for the 3,000-ton steel cruisers *Boston* and *Atlanta* will be built in the Brooklyn navy-yard during the present fiscal year.

I have to recommend that the money obtained from the sale of vessels afloat, which were recently disposed of, be used so far as may be necessary in the taking to pieces of vessels on the stocks in our navy-yards. Many of them have remained in an uncompleted condition since the late war, some longer, and they must now be taken apart where they are, as they are badly decayed and cannot be launched. This work should be done by navy-yard employes, and not by contract with outside parties; the latter would not be subject to navy-yard regulations, and would claim free use of Government tools and appliances for doing the work. In breaking up these vessels, all the copper, composition, and lead materials can be recovered, sent to the copper-rolling mill at the Washington navy-yard, and reworked with profit to the Government. If private parties find it profitable to come into our navy-yards to break up these vessels, it can be made equally profitable to the Government.

The double-turreted monitors *Massachusetts*, at the Portsmouth, N. H., navy-yard, the *Oregon*, at the Boston yard, and the *Colossus*, at the Brooklyn navy-yard, have iron diagonal truss-frames in them which cost, originally, \$157,000 each, and as these frames are all keyed together they can be readily and economically removed from the vessels, shipped to the Washington navy-yard, and worked over into such sizes of materials as may be required for use in new vessels, or repairs of old ones in the future.

In the sale of old materials, which has lately taken place, while the Boards, in some instances, recommended that the plates, turret-gear, &c., belonging to the turrets of the double-turreted monitors before mentioned be disposed of, the Bureau struck those articles from the list, preferring their retention for future use, although the practice in the past has been to dispose of them.

During the late civil war, and up to and including the time of the completion of the *Trenton* in 1876, the Bureau of Construction and Repair furnished steam windlasses and steam steerers to all vessels requiring them. When the new *Miantonomoh* was building, the Bureau contracted for and placed on board of that vessel a steam steerer and steam windlass. At the time of her completion, however, the Bureau of Steam Engineer-

ing purchased and placed on board a second steam steerer, which has never been made to work satisfactorily, and, for all the use that has been made of it, it might better be put ashore. From that time to March, 1882, by what authority this Bureau is not advised, the Bureau of Steam Engineering supplied many vessels of the Navy with steam-capstan machinery. From March, 1882, in accordance with General Order No. 293, and until that portion of said order relating to the cognizance of steam steerers and steam capstans was revoked by the Department's order of September 28, 1883, this Bureau had control of furnishing steam steerers and steam capstans to vessels of the Navy. During that period it contracted for steam capstans of the kinds and prices as follows:

Name of ship.	Size of chain.	Contract price.	Manufacturer.
	<i>Inches.</i>		
Omaha	1 $\frac{5}{8}$	\$5,000	Providence Steam Engine Company.
Kearsarge	1 $\frac{1}{4}$	3,750	Do.
Nipsic	1 $\frac{1}{4}$	2,500	J. P. Manton, Providence, R. I.
Swatara	1 $\frac{5}{8}$	3,300	Do.
Shenandoah	1 $\frac{5}{8}$	3,300	Do.
Ossipee	1 $\frac{5}{8}$	3,300	Do.
Marion	1 $\frac{5}{8}$	3,300	Do.

After contracting for the capstan machinery of the Omaha and Kearsarge, the Bureau was notified that J. P. Manton, of Providence, R. I., had established a manufactory of capstan machinery, steam windlasses, and steam steerers at Mansfield, Mass. Under instructions from this Bureau, by order of the Department, dated April 2, 1883, Naval Constructors Thomas E. Webb and George R. Boush, U. S. N., were directed to proceed to Providence, R. I., and examine carefully into the details of the steam machinery for operating capstans of vessels of war, as manufactured both by the Providence Steam-Engine Company, of which H. W. Gardner is treasurer, and by Joseph P. Manton, of Providence, and report which they considered best adapted to naval vessels, having in view the weight of the steam appliances, room occupied by the capstans on deck, and their respective capacity for doing the work. They reported, under date of June 14, 1883, that they had visited the works of the Providence Steam-Engine Company, in Providence, R. I., and the works of the Manton Windlass and Steam Steerer Company, at Mansfield, Mass., where the Manton capstans are manufactured; that in the manufacture of capstans by both companies the materials and workmanship were of the best quality and ample in strength. The prices asked to deliver the several sized capstans, the weight and room occupied by each, were reported as follows:

PROVIDENCE STEAM-ENGINE COMPANY.

Price.	Size of chain.	Weight (about).	Room or air-space.
	<i>Inches.</i>	<i>Pounds.</i>	<i>Cubic feet.</i>
\$6,000	2	13,823	40
5,000	1 $\frac{5}{8}$	7,950	25
3,750	1 $\frac{1}{4}$	6,455	21

ENGINES, TWO IN NUMBER.

Size.	Diameter.	Stroke.
<i>Inches.</i>	<i>Inches.</i>	
2	16	14
1 $\frac{5}{8}$	13	12
1 $\frac{1}{4}$	10 $\frac{1}{2}$	10

MANTON CAPSTAN AND STEAM-WINDLASS COMPANY.

Price.	Size of chain.	Weight (about).	Room or air-space.
	<i>Inches.</i>	<i>Pounds.</i>	<i>Cubic feet.</i>
\$3,800	2	10,000	18
3,300	1 $\frac{5}{8}$	7,000	13 $\frac{1}{2}$
2,500	1 $\frac{1}{4}$	5,000	9

ENGINES, TWO IN NUMBER, EACH.

Size.	Diameter.	Stroke.
<i>Inches.</i>	<i>Inches.</i>	
2	12	12
1 $\frac{5}{8}$	10	10
1 $\frac{1}{4}$	7	8

They further report that the Providence Steam-Engine Company's capstans are driven by three trains of spur-gear, the Manton by a worm and wheel, and that each system has its recommendation. They call attention to the fact that Chief Engineer Henderson, Assistant Engineer Morley, and Naval Constructor Pook constituted a Board which, under date of October 18, 1876, reported favorably to this Bureau upon a steam windlass erected on board the U. S. Monitor Roanoke, in which the worm and wheel were used.

The Board report, finally, that both systems are recommended by high authority, but that the Manton capstan is simpler in its construction, of less weight and price, occupies less cubical air-space on the deck, and has the capacity to do the work required of it. They therefore recommend the Manton capstan as better adapted for naval vessels.

The Bureau desires respectfully to call the attention of the Department again to the recommendations made by Commodore Stephen B. Luce, president of the Navy-Yard Commission, under date of June last, and to urge the necessity of this Bureau retaining, permanently, the entire supervision of the work of building and repairing vessels of war, over which, through your indulgence, it has continued to exercise control, notwithstanding the recommendation of the commission. I earnestly request that in forwarding to Congress the report of the Commission, you will invite attention to the manifest wrong, and the evil consequences that are likely to follow, if the work, properly pertaining to this Bureau, shall be turned over to the Bureau of Steam Engineering as recommended. The desirability and feasibility of the closing of certain navy-yards, and the concentration of organization, and reduction of expenses in the remaining yards, would seem to be the objects which the commission was organized to consider; and to any but those who either do not practically understand the details of work in our navy-yards, or who

are unduly prejudiced in favor of a system as yet untried, and of doubtful expediency, a continuance of present methods would be recommended. When carefully looked into, and fairly considered, it appears at once, that where concentration is recommended in the memorandum by the Commission, it is principally in the interests of the Bureau of Steam Engineering, taking from under the cognizance of this Bureau a very large amount of the work now done in building and fitting a vessel of war for service, and placing it almost entirely under the control of the Bureau of Steam Engineering. Under no such *régime* could the greatest possible economy of expenditure be accomplished, either under a peace or a war establishment. The first recommendation made "is the abolition of all shops doing the usual work of machine shops, except those of steam engineering." If this were carried out, the work under this Bureau would not be interfered with in its iron-plating shops any more than in the ordnance machine shops, where guns are manufactured; or in the equipment galley shop, where in the Washington navy-yard galleys are made for cooking purposes. The Commission further recommend the abolishment of all boiler and plate-iron shops, except those of steam engineering; and under the several navy-yard lists of foremen, they recommend that the position of foreman of iron-platers be abolished, and that shop placed under the control of steam engineering. The steam engineering departments of our navy-yards have always had boiler-shops, where the boilers of steam vessels were built and repaired, but they have *never* had an iron-plating shop. The department of construction and repair has had, during and since the war, iron-plating shops, but *no* boiler-shops, nor is there any similarity in the work done in them. To those who are without information as to the character of the work done in the construction iron-plating shops, and their intimate relations to all other branches of work coming under cognizance of this Bureau, in the building and repairing of vessels of war, whether of wood, iron, or steel, the recommendation might seem reasonable, there being many tools used in them such as may be found in steam engine machine shops. But this is also the case in the ordnance and equipment shops, to which the recommendation does not apply.

In order to illustrate fully what an iron-plating shop is, I have to call your attention to the one in the Brooklyn navy-yard; those in the other yards being fitted with tools, to a greater or less extent, of the same general character, and for like use. This building, one of the best in the yard, was erected a few years since, by the Bureau of Yards and Docks, for the purposes of this Bureau; and it has been fitted up, from year to year, as the funds of the Bureau would permit, with modern tools of the best quality for doing the work required in the building and repairing of iron and steel ships, and fitting the immense amount of iron, steel, composition, and brass work, such as iron deck-frames over the boilers in wooden vessels; iron knees, breast-hooks and riders, and diagonal braces and head-straps; boat-davits and cradles; iron and composition hatch-combings; iron and composition hatch canopies; composition cat-heads; iron fish-davits; iron hatch-cranes and fittings; fitting up of capstans and windlasses; iron and composition blocks, and sheaves used for boat-davits, cat-heads, and rigging of masts and spars of vessels; iron and composition work used in building and fitting up of masts and yards; iron and composition work used in connection with the building of boats; fitting up of all pumps in the vessels; fitting up of all air-ports and repairing same; building and repairing of all water-tanks; together with a thousand and one minor fittings used in connec-

tion with the work of the several departments—joiners, plumbers, carpenters, &c.—coming under cognizance of this Bureau. In building iron or steel vessels, the frames, beams, plates, &c., would be prepared, which was done in the past, in building the United States torpedo-ram Alarm, and will undoubtedly be done again in the near future, for it does not seem possible that hereafter the Government intends to have all such work done by contract.

Those who are interested in having the iron-plating shops turned over to the department of steam engineering will probably say that in these shops only, machinists are employed, which is not the case, any more than in the iron ship-building yards of the Messrs. John Roach & Son, at Chester, Pa., W. Cramp & Sons, Philadelphia, or Harlan & Hollingsworth, Wilmington, Del., in each of which establishments the shipbuilding tools, &c., are in separate portions of the yards from their ordinary steam-engine machine tools, and are under the control and direction of foremen, who are experts in their respective branches, one having no connection with the other. Having, in 1870, visited nearly every ship-building establishment, public or private, of any importance, in England and Scotland, I can vouch for the fact that their work is carried on in the same general manner.

The building of the turret frames and alterations in the hull of the double turreted monitor Miantonomoh will be proceeded with during the present fiscal year, and all of the work will be prepared for use in the iron-plating shop of the Brooklyn navy-yard. In the block lists of the new cruisers, as well as of all other naval vessels, are comprised a large number of composition, iron, iron-strapped, and patent-roller bushing-sheaved blocks, all of which are fitted up in these shops; and this is the case also with all the metal work used in building and fitting the boats of naval vessels, consisting of metal breast-hooks, thwart-knees, rowlocks, stem-bands, rudder pintles and braces, metal yokes for rudders, fittings for boats, spars, boat-hooks, &c.

The work before mentioned will, of course, be done under the control and supervision of this Bureau and its representative in the yard, the naval constructor, as no such work could possibly be done properly, efficiently, and economically under the direction of an engineer officer uneducated to superintend such work, and from the very nature of his profession knowing but little, if anything, of its requirements.

The Commission recommend that all coppersmiths' and plumbers' shops be abolished, including the position of master plumber, and such work placed under steam engineering. As a matter of fact, the department of construction has no regular coppersmiths' shops, but it has plumbers' shops, while the reverse is the case with steam engineering. The only plumbing work that the engineering department ever has to do, that I am aware of, is the covering of the felt on their boilers with sheet lead, and very often the construction department does this work for them; while the work of the master plumber in the construction and repair department of our navy-yards consists of the lining of the magazines and shell-rooms with lead; putting in of all flood-cocks, waste and overflow valves, and light boxes for same; fitting up water-closets and latrines for officers and crew; putting in all lead pipes connected with water-closets, pumps for washing decks or for fire purposes, galley pump and scuttle butt; lining the floors with lead in the quarter galleries, men's heads, and firemen's and officers' wash-rooms; lining all air-port or other openings cut through the vessels with lead; making and putting in all pipes for ventilating purposes; putting in all deck scuppers; making, putting in place, and connecting all tanks of

lead or copper used in water-closets, quarter galleries, and general store-rooms; making and fitting complete all bath-tubs and sinks for washing purposes; lining all sail-rooms with zinc, and all bread-rooms with tin; the whole of which, together with many other minor fittings and jobs of plumbing work required to be done in the course of building or repairing a vessel of war, can in no way be classed as work pertaining to the duties of an engineer officer of the Navy, and should be done in the future, as it has always been done in the past, properly, economically, and expeditiously, under the direct control and supervision of this Bureau and the naval constructor of the yard. In no private or public shipbuilding establishment has such an experiment ever been made as the turning of such work over to the control of engineers, and if attempted now it can result only in entire failure, entailing much unnecessary expense in time and money, instead of a saving effected as desired.

The recommendation of the Commission to build all boats and blocks in one yard is not practicable. It would not be economical to build boats and blocks in the East to send to the Mare Island yard, in California; and as there will be only three yards left open on the Atlantic coast, provided the report of the Commission is approved, I should certainly deem it the wiser plan to build all boats and blocks at the yards where the vessels are repaired. There is hardly a navy-yard in the country without boats and blocks on hand, either new or that can be repaired and used. It would be almost impossible to select at an eastern yard such articles as would be required in the course of the work when it is taken in hand at Mare Island, but if it were not done then, the delay in making requisition, the loss of time if the articles were not made exactly according to order, or not in time to meet the demands of the riggers and others, would retard the completion of the work and entail much greater expense than under the present system, where all the work proceeds in such a manner that no delay is occasioned on account of davits and cradles for stowing not being of the proper shape, size, &c. The fact that davits and cradles for boats could not be completed until the boats arrived from the yard where they were building, and the fact that their completion might often be delayed, for some cause or another, will further illustrate the embarrassment. No naval constructor would have concurred in such a recommendation.

The work which pertains to the designing, building, repairing, and fitting of vessels of war, as now carried on in our navy-yards, to be done properly, expeditiously, and economically, must be done in such a manner that the commandant and naval constructor of the yard, acting under the direction of this Bureau, so far as its authority extends, shall be able to direct and supervise all the work for which it is responsible. Concentration of labor will not answer in practice, unless there is a corresponding concentration of responsibility. This Bureau, in other words, should not be held responsible for the proper performance or results of work which is given to another Bureau to perform. It would, in my opinion, be confusion worse confounded to make the changes proposed by the Commission, so far as they relate to this Bureau. They could no more be made to operate without detriment to the interests of the Government than could be the placing of the duties of this Bureau entirely in the hands of steam engineering.

Instead of economizing in the manner proposed, by the saving of a few dollars in the abolishment of a few master-workmen, and turning their work over to steam engineering, thousands of dollars in time and money would be wasted in the several navy-yards by incompetent

direction of work, in the placing it in the hands of those without practical knowledge or experience in the requirements of the work which they would be called upon to supervise and direct.

In conclusion, I sincerely believe that every naval constructor ardently longs that, when his career of active usefulness is ended, and he has gained the right by age, length of service, and honest work to retire, he may see himself succeeded by a man possessing greater knowledge, higher skill, and better training than he has had the good fortune to enjoy; and he should be willing to contribute all that is in his power to the success and advancement of those who are to succeed him. The progress of science, of discovery, and of improvement is going on at such a pace throughout the whole civilized world that I do not think the very best education we can conceive of, or at present contrive, will be more than sufficient to enable our successors to compete on fair terms with the naval constructors of England and France. It seems to me an unquestionable obligation to those who are to take the places of the present members of the corps, to give them a start that shall be in no way inferior to the educational advantages and training of English and French naval architects. We have our navy-yards and a few private shipbuilding yards, in which the young men who are to fill our places may acquire the manual dexterity and practical experience of shipbuilding—advantages in which those who have filled positions in the corps in the past have never been deficient. It matters not how high the theoretical and scientific acquirements of a man may be in England and France, or whether he has passed through the School of Naval Architecture or the Ecole Polytechnique; unless he started as an apprentice in the dock-yards, passed through the prescribed course, and graduated at one of the schools above named, he can never reach the position of naval constructor.

There is a tendency among the officers of the service to underestimate the value of the kind of training for naval architects which I am here advocating. They think it enough that he should have passed through the Naval School and have been graduated high in his class, to entitle him to be appointed to the position of assistant constructor. No person should be appointed an assistant naval constructor until he has been examined by a thoroughly competent board of professional officers and has proven that he has an intimate knowledge of the properties of all the materials that enter into the construction of a vessel of war, either of wood, iron, or steel; of their relations to one another when brought into combination; of the best modes of preparing them for their destined purpose; and of the details of actual construction. He should be a good draftsman, able to make every necessary drawing and calculation connected with the designing of naval vessels.

Chief Constructor W. H. White, of the English navy, in his valuable paper "On the course of study in the Royal Naval College, Greenwich," published in the 18th volume of the Transactions of the Institution of Naval Architects for 1877, says:

"It will be observed that no professional subjects are included in the lists of subjects for examination, but it is very probable that the omission will not be continued. Experience has shown the desirability of, if not necessity for, some amount of previous knowledge of shipbuilding, in order that the subsequent studies may be successfully prosecuted. At least an elementary knowledge of shipbuilding, ship drawing and laying off should be acquired by students before entry; and a year or two might be well spent in our ship-yards before joining. Nor should the previous mathematical education of students stop short at the subjects named above, if the full advantages of the college course are to be realized. Many years' experience as student and teacher in the Kensington school and at Greenwich has convinced me that there is

ample work to be done by every successful student, however well prepared he may have been before entry into the naval architecture classes. The better his preparation the further will he advance in the study of the subjects for which this department of the college specially exists. I am not acquainted with a single instance in which the want of previous training, and especially of mathematical training, has been compensated for by the most assiduous efforts, after a student has joined; and the vacations of the college are so brief that if a student does not acquire a good knowledge of practical shipbuilding before he enters, he will certainly have to wait until his course of study there is finished before he can thoroughly supply the deficiency. Neither practical nor mathematical knowledge can be left to be acquired entirely at the college without grave disadvantages being incurred.

All the admiralty students have the great advantage of spending five or six years in a dock-yard before joining the college; they consequently have opportunities of becoming skilled workmen and fair draftsmen, besides acquiring familiarity with the building and fitting of ships. Concurrently with this they receive a mathematical training which is much in advance of that required to pass the entrance examination above described, and on entry the average admiralty student possesses a knowledge of the differential and integral calculus with their applications to mechanics, &c. This previous training is never found to be too extended, but it is a great gain in all subsequent work. The cases wherein private students have successfully competed with admiralty students have been very few, and their failure has resulted from the disadvantages of their preliminary training, not from want of ability or application."

The views of the Bureau as to the best method of educating our future naval constructors are embodied in its letter to the Department, under date of May 16, 1882, as follows:

"The naval constructors in the English navy have for years been supplied from a small body of students who begin their careers as shipwright apprentices, three of whom are admitted each year to a course of three years at the Royal Naval College, Greenwich, England. This course is the highest pursued at the college, and is of the very first importance to the naval service. These students are obtained by a very simple and admirable method adopted by the admiralty for the appointment and training of shipwright apprentices in the dock-yards. From among those who have served five years are selected, by competitive examination, the three who are to have the course of study at the Royal College. On passing the examination at the end of the three years' course, they are appointed assistants to foremen at the dock-yards, and later to positions as assistant draftsmen, draftsmen, assistant constructors, constructors, and chief constructors; the highest position being that of director of naval construction.

The best way for our Government to educate our future naval constructors is to commence by appointing to the position of shipwright apprentice young men who have a first-class common-school education, and who, after three or four years of practical training in our navy-yards, could be examined competitively, and three selected annually to be sent to the Naval Academy for further study in the higher branches of mathematics, mechanics, and the French language; after being graduated from there they should be sent abroad and entered at the Royal Naval College, Greenwich, for a full course in naval architecture.

By this means, and no other, can we expect to educate the naval constructor of the future that he may be able to keep pace with and participate in the great strides now making in the science and art of naval construction."

During the present year the number of naval constructors has been reduced by the death of one, namely, Edward Hartt, and by an inspection of the following list it will be seen that a few years will, by age alone, remove a number of others:

NAVAL CONSTRUCTORS.

George W. Much will be retired.....	June 22, 1887.
George R. Boush will be retired.....	October —, 1888.
Samuel H. Pook will be retired.....	January 17, 1889.
William L. Mintonye will be retired	December 4, 1891.
Robert W. Steele will be retired	April 13, 1893.
Thomas E. Webb will be retired	May 29, 1894.
Frank L. Fernald will be retired	November 11, 1897.
William H. Varney will be retired	April 19, 1900.
Philip Hichborn will be retired	March 4, 1901.
Theodore D. Wilson will be retired.....	May 11, 1902.

ASSISTANT NAVAL CONSTRUCTORS.

George F. Mallett will be retired	October 23, 1894.
John F. Hanscom will be retired	May 21, 1904.
John B. Hoover will be retired	June 23, 1898.
Joseph Feaster will be retired	August 5, 1899.
Richard Gatewood will be retired	September 25, 1921.
Francis T. Bowles will be retired	October 7, 1920.
John L. Shock will be retired	March 3, 1922.
Joseph H. Linnard will be retired	September 27, 1922.
Joseph J. Woodward will be retired	October 2, 1922.

There are four assistant constructors at the head of the list, who are thoroughly capable, and have often been called upon to assume control of the construction departments of our navy-yards in the absence of the naval constructors. The next two, while undoubtedly they are men of good theoretical attainments, the only practical knowledge they possess is what they obtained in private dock-yards in England, while attending the course of study at the Royal Naval College, Greenwich, and until they have had more experience in some one of our own navy-yards, under a practical constructor, in handling large gangs of men and directing their work, they could not be intrusted with the management of so important a branch of the naval service as the construction department of a navy-yard, involving, as it does, the proper disbursement of very large sums of money. Practical knowledge and experience of this kind cannot be bought; they come with years of toil and work.

The last three assistant constructors on the list were recently appointed from the corps of cadet midshipmen, and they are without either theoretical or practical knowledge of the subject of naval architecture and shipbuilding, and will be under tuition, at home and abroad, for several years before they can be of any benefit to the Government. It is desirable, if not essential, that a few men should be appointed from civil life possessing the theoretical and practical mechanical qualifications to enter at once upon the duties of assistant naval constructors in our navy yards, and I therefore recommend that an examination be held of such candidates as the Bureau has already recommended in its letter to the Department, under date of September 27, 1883, and that two or three of those who prove best qualified be appointed at once. The necessity for detailing assistant naval constructors to superintend the building of the new steel cruisers leaves no assistant for duty at any navy-yard except New York and California, while there should be one at Portsmouth, Boston, and Norfolk, to assist the constructor, and in his absence to assume his duties.

Experience has demonstrated the importance of limiting the numbers of the corps, and I would suggest that the number be limited to eleven naval constructors and eleven assistant naval constructors.

By section 1477 of the Revised Statutes, assistant naval constructors have the relative rank of lieutenant and lieutenant of the junior grade; yet they hold an appointment from the Department only. In justice to these officers, I have to recommend that they be commissioned, and by that means relieved from the uncertainty of tenure by which they now hold office. This anomaly, of an officer having relative rank, wearing the uniform, and being without a commission, does not exist in any other corps in the naval service.

I have the honor to be, very respectfully, your obedient servant,

T. D. WILSON,
Chief of Bureau.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Construction and Repair.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be re- quired for each detailed object of expenditure.	Total amount to be appropriated un- der each head of appropriation.	Amount appropri- ated for the cur- rent fiscal year ending June 30, 1884.
SALARIES.			
Chief clerk (appropriated)	\$1,800 00		
Draftsman (appropriated)	1,800 00		
One clerk of class four (appropriated)	1,800 00		
One clerk of class three (appropriated)	1,600 00		
One clerk of class two (appropriated)	1,400 00		
One assistant draftsman (appropriated)	1,400 00		
One clerk of class one (appropriated)	1,200 00		
One assistant messenger (appropriated)	720 00		
One laborer (appropriated)	660 00		
Three draftsman, at \$1,400 per annum each (submitted)	4,200 00		
One clerk (submitted)	1,000 00		
		\$17,580 00	\$12,380 00
CONTINGENT.			
Stationery and miscellaneous items (appropriated)	600 00		
Fitting drawing room with cases, tools, &c. (submitted)	1,000 00	\$1,600 00	
CONSTRUCTION AND REPAIR OF VESSELS.			
Preservation and completion of vessels on the stocks and in ordinary; purchase of materials and stores of all kinds; labor in navy-yards and on foreign stations; purchase of machinery and tools for use in shops; wear, tear, and re- pair of vessels afloat, and for general care, increase, and protection of the Navy in the line of construction and re- pair; incidental expenses, such as advertising, foreign postages, telegrams, photographing, books, plans, sta- tionery, and instruments for drawing-room (appropri- ated)	1,750,000 00	1,750,000 00	1,100,000 00
DOUBLE-TURRETED MONITORS.			
Completing four double-turreted monitors, as follows:			
Puritan (appropriated)	955,341 56		
Terror (appropriated)	627,287 68		
Amphitrite (appropriated)	639,583 68		
Monadnock (appropriated)	701,441 70	2,923,654 62	
INCREASE OF THE NAVY.			
Completing three new steel cruisers and one dispatch boat, authorized by act of Congress, approved March 3, 1883, as follows:			
Chicago, appropriated, act of March 3, 1883	349,133 45		
Boston, appropriated, act of March 3, 1883	231,853 28		
Atlanta, appropriated, act of March 3, 1883	231,853 27		
Dolphin, appropriated, act of March 3, 1883	108,660 00		
Completing the New York at the Brooklyn navy-yard, and the Mohican at the Mare Island navy-yard (submitted) ..	400,000 00		
Labor in building two clipper bark-rigged sailing vessels for training squadron, (submitted)	100,000 00		
Tools required in navy-yards for building iron and steel vessels (submitted)	150,000 00	1,571,500 00	
CIVIL ESTABLISHMENT.			
At the navy-yard, Kittery, Me.:			
One clerk to naval constructor	1,400 00		
One clerk of storehouses	1,300 00		
Three writers, at \$1,017.25 each	3,051 75	5,751 75	
At the navy-yard, Boston, Mass.:			
One clerk to naval constructor	1,400 00		
One clerk of storehouses	1,300 00		
Three writers, at \$1,017.25 each	3,051 75	5,751 75	

Estimates of appropriations required, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1884.
CIVIL ESTABLISHMENT—Continued.			
At the navy-yard, Brooklyn, N. Y.:			
One clerk to naval constructor	\$1,400 00		
One clerk of storehouses	1,300 00		
Three writers, at \$1,017.25 each	3,051 75		
		\$5,751 75	
At the navy-yard, League Island, Pa.:			
One clerk to naval constructor	1,400 00		
One clerk of storehouses	1,300 00		
Two writers, at \$1,017.25 each	2,034 50		
		4,734 50	
At the navy-yard, Washington, D. C.:			
One clerk to naval constructor	1,400 00		
Two writers, at \$1,017.25 each	2,034 50		
		3,434 50	
At the navy-yard, Norfolk, Va.:			
One clerk to naval constructor	1,400 00		
One clerk of storehouses	1,300 00		
Three writers, at \$1,017.25 each	3,051 75		
		5,751 75	
At the navy-yard, Pensacola, Fla.:			
One writer	1,017 25		
		1,017 25	
At the navy-yard, Mare Island, California:			
One clerk to naval constructor	1,400 00		
One clerk of storehouses	1,300 00		
Two writers, at \$1,017.25 each	2,034 50		
		4,734 50	
		36,927 75	\$20,052 87

No. 15.—BUREAU OF STEAM ENGINEERING.

NAVY DEPARTMENT,
BUREAU OF STEAM ENGINEERING,
Washington, October 30, 1883.

SIR: In obedience to your order of October 13, I have the honor to submit to the Department the annual report of this Bureau for the past year, together with the estimates for the fiscal year 1884-'85, and the estimates for the completion of the steel cruisers:

APPROPRIATION, STEAM MACHINERY, 1883.

Amount appropriated for fiscal year 1882-'83, act approved August 5, 1882	\$1,600,000 00
Reserved for launching monitors, &c., same act	400,000 00
Balance	1,200,000 00
Expended:	
For labor in navy-yards and stations, in constructing new engines, boilers, and their dependencies; repairing old boilers, machinery, &c., and fitting vessels for sea service; preservation of tools; handling and preservation of materials and stores	\$619,207 68
For purchase of materials, stores, machine-tools, freights, and incidental expenses	488,534 30
For payments on foreign stations for repairs, materials, &c.	38,128 51
	1,145,870 49
Less repayments by transfers in adjustment of appropriations	3,785 10
Total expenditure	1,142,085 39
Balance on hand	57,914 61

This balance of \$57,914.61, however, is covered by obligations of the Bureau for purchases, &c., at home and abroad, the vouchers for which have not yet been received or the accounts not yet settled.

APPROPRIATION, DOUBLE-TURRETED MONITORS.

(Reserved from appropriation steam machinery, as above.)

For preparing monitors for launching, &c	\$400,000 00
Expended:	
By Bureau of Steam Engineering	\$57,841 54
By Bureau of Construction and Repair	94,902 00
	150,743 54
Balance on hand	249,256 46

This balance will be required for expenditure under Bureau of Construction and Repair for building and fitting the turrets and pilot-house of the Miantonomoh, as provided in above act, and for work on said monitors now being done under that Bureau.

APPROPRIATION, MACHINERY, DOUBLE-TURRETED MONITORS.

Appropriated act approved March 3, 1883	\$1,000,000 00
Expended on monitor machinery	136,737 51
Balance on hand	863,262 49

This balance will be required to pay for the completion of engines, &c., for monitors Puritan, Terror, and Amphitrite, now under contract, and for Monadnock, yet to be contracted for.

DEFICIENCY APPROPRIATION, ACT APPROVED JUNE 14, 1878.

Since the last annual report of this Bureau there has been paid from this appropriation—

To William Cramp & Sons \$14,000 00

There yet remains to be paid from said appropriation, for work now being completed, the following sums, viz:

To Harlan and Hollingsworth Company \$12,881 68
To William Cramp & Sons 8,850 00

Total 21,731 68

GENERAL OPERATIONS OF THE BUREAU.

The following table will exhibit the character and cost, for labor and materials, of the work done under cognizance of this Bureau for the fiscal year ending June 30, 1883, upon the machinery, boilers, &c., with outfits, stores, &c., of naval vessels, and the expenditures for maintenance, &c., at the several navy-yards and stations:

Name of vessel.	Rate.	Engines, boilers, and machinery.	Stores and outfits.	Total.	Remarks.
Alaska	2d.....	\$1,283 77	\$727 80	\$2,011 57	Slight repairs made.
Adams.....	3d.....	7,301 91	2,473 66	9,775 57	In service; new boilers being made.
Alliance	3d.....	23,737 02	3,226 51	26,963 53	In service; slight repairs made; new boilers being built.
Ashuelot	3d.....	.....	1,630 59	1,630 59	Lost February 18, 1883.
Alert	3d.....	38,294 37	.....	38,294 37	Thoroughly repaired, and new boilers put in.
Alarm	Torpedo ram	11,045 10	16 44	11,061 54	Steering propeller repaired.
Ajax.....	Iron-clad.....	.....	395 76	395 76	Preserving machinery.
Amphitrite	Iron-clad.....	6,504 50	.....	6,504 50	Preparing machinery for launching.
Brooklyn	2d.....	.....	1,378 16	1,378 16	In service; stores.
Colorado.....	1st.....	188 46	135 20	323 66	Receiving-ship; preserving machinery.
Congress	2d.....	373 49	.....	373 49	Preserving machinery.
Canandaigua.....	2d.....	13 50	.....	13 50	Do.
Canonicus	Iron-clad	379 18	1,023 11	1,402 29	Do.
Catalpa.....	Tug	1,274 46	217 48	1,491 94	In service; slight repairs made.
Cohasset.....	Tug	408 21	154 49	562 70	Do.
Despatch	4th.....	6,612 81	944 57	7,557 38	In service; sundry repairs made.
Dictator	Iron-clad	827 69	.....	827 69	Preserving machinery.
Essex.....	3d	3,014 18	1,403 61	4,417 79	New crank shaft and slight repairs made.
Enterprise.....	3d	1,525 10	1,232 59	2,757 69	In service; sundry repairs made.
Emerald.....	Tug	1,059 34	.....	1,059 34	Sundry repairs.
Franklin.....	1st.....	804 19	3,550 01	4,354 20	Receiving-ship; preserving machinery.
Frolic	4th	52 27	.....	52 27	Preserving machinery.
Fortune	Tug	29,384 20	321 83	29,706 03	New boilers on hand and sundry repairs.
Guard	4th.....	42 52	.....	42 52	Slight repairs.
Galena	3d.....	5,649 31	946 20	6,595 51	In service; new tubes put in, and slight repairs made.
Hartford.....	2d.....	2,388 83	11,853 59	14,242 42	In service; slight repairs made, with stores and outfits.
Iroquois.....	3d.....	600 54	965 19	1,565 73	In service; slight repairs made.
Intrepid	Torpedo ram	46 02	18 41	64 43	Preserving machinery.
Iowa.....	1st.....	273 40	.....	273 40	Do.
Juniata	3d.....	33,656 92	7,705 72	41,362 64	New boilers put in, with thorough repairs; in service.
Jason	Iron-clad.....	699 86	.....	699 86	Preserving machinery.
Javelin	Launch .....	.....	125 00	125 00	Stores; preserving machinery.

Name of vessel.	Rate.	Engines, boilers, and ma- chinery.	Stores and outfits.	Total.	Remarks.
Jean Sands	Tug	\$50 08	.....	\$50 08	Preserving machinery.
Kearsarge	3d	6,286 24	\$3,439 15	9,725 39	In service; sundry repairs made.
Kansas	3d	324 94	.....	324 94	Preserving machinery.
Lancaster	2d	2,002 69	2,034 86	4,037 55	In service; sundry repairs made.
Lackawanna	2d .....	.....	1,279 88	1,279 88	In service; stores.
Leyden	Tug	3,744 23	148 05	3,892 28	In service; sundry repairs made.
Marion	3d	5,905 81	1,320 41	7,226 29	New boilers being constructed.
Mohican	3d	43,672 67	.....	43,672 67	New engines, &c., being constructed.
Monocacy	3d	1,153 10	1,271 09	2,424 19	In service; slight repairs made.
Michigan	4th	64 69	52 70	117 39	Do.
Minnesota	1st	319 98	978 22	1,298 20	Preserving machinery.
Montauk	Iron-clad	2,441 44	1,659 83	4,101 27	Sundry repairs made.
Miantonomoh	Iron-clad	27,747 34	4,523 62	32,270 96	Alterations in machinery, and preparing same for sea service.
Mayflower	Tug	2,418 58	238 09	2,656 67	New tubes put in; slight repairs made.
Monterey	Tug	5,340 88	.....	5,340 88	In service; sundry repairs made.
Nipsic	3d	15,237 13	5,825 56	21,062 69	Thoroughly repaired, &c.
New York	1st	25,971 16	.....	25,971 16	New boilers being constructed.
New Hampshire	1st	165 48	25 75	191 23	Repairs to launch.
Nahant	Iron-clad .....	.....	87 89	87 89	Stores; preserving machinery.
Nantucket	Iron-clad	850 10	2,383 20	3,233 30	Repairs made; and preserving machinery.
Nina	Tug	76 90	.....	76 90	In service; slight repairs made.
Omaha	2d	23,750 68	.....	23,750 68	New boilers being put in; and thorough repairs being made.
Ossipee	3d	73,991 96	.....	73,991 96	New boilers put in; with thorough repairs.
Onward	4th .....	.....	102 99	102 99	Store-ship; stores.
Powhatan	2d	6,769 54	3,274 17	10,043 71	In service; extensive repairs made.
Pensacola	2d .....	.....	703 90	703 90	In service; stores.
Palos	4th	356 29	378 52	734 81	Do.
Plymouth	2d	5,253 04	.....	5,253 04	Sundry repairs made.
Passaic	Iron-clad	3,064 21	45 49	3,109 70	Slight repairs made; and preserving machinery.
Puritan	Iron-clad	8,622 75	.....	8,622 75	Preparing the machinery for launching.
Phlox	Tug	3,890 59	.....	3,890 59	In service; sundry repairs made.
Pilgrim	Tug	5,756 92	195 48	5,952 40	Do.
Pinta	Tug	22,003 88	7,368 03	29,371 91	New boilers put in; and thorough repairs.
Quinnebaug	3d	14 48	3,350 04	3,364 52	In service; slight repairs made.
Richmond	2d	134 69	1,403 20	1,537 89	Do.
Ranger	3d	3,504 01	3,255 64	6,759 65	In service; sundry repairs made.
Rescue	Tug	12,714 31	.....	12,714 31	New boilers completed; with general repairs.
Rocket	Tug	5,182 05	.....	5,182 05	Extensive repairs.
Shenandoah	2d	24,418 44	247 87	24,666 31	New boiler put in; with thorough repairs.
Swatara	3d	4,514 79	5,902 43	10,417 22	In service; general repairs; stores and outfit.
Shawmut	3d	224 46	.....	224 46	Preserving machinery.
Seaweed	Tug	277 54	.....	277 54	Slight repairs made.
Snowdrop	Tug	567 89	282 01	849 90	In service; slight repairs made.
Speedwell	Tug	5,491 47	50 02	5,541 49	In service; general repairs made.
Standish	Tug	3,408 62	363 95	3,772 57	In service; new tubes put in; slight repairs made.
Tennessee	1st	5,089 35	9,787 01	14,876 36	In service; extensive repairs made.
Trenton	2d	74,374 81	.....	74,374 81	In service; and thorough repairs made.
Tallapoosa	4th	6,295 92	2,958 17	9,254 09	In service; general repairs made.
Terror	Iron-clad	6,504 50	.....	6,504 50	Preparing the machinery for launching.
Triana	Tug	1,497 57	181 40	1,678 97	In service; slight repairs made.
Vermont	2d	211 24	.....	211 24	Steam heaters.
Vandalia	2d	10,046 87	2,956 50	13,003 37	In service; new boilers being constructed.
Wachusett	3d	3,855 25	1,928 55	5,783 80	In service; general repairs made.
Wyoming	3d .....	.....	18 58	18 58	Stores.
Wabash	1st	1,416 34	615 34	2,031 68	Receiving-ship; slight repairs made.
Worcester	2d	148 56	.....	148 56	Preserving machinery.
Wyandotte	Iron-clad	84 72	241 50	326 22	Do.
Yantic	3d	711 18	2,458 94	3,170 12	In service; slight repairs made.
Total .....	.....	645,363 51	113,784 02	759,147 53	

Expenditures at navy-yards and stations not included in the amount expended on naval vessels.

Navy-yards.	Yard expenses.	Miscellaneous.	Total.
Portsmouth, N. H.....	\$36,382 42	\$7,010 39	\$43,392 81
Boston, Mass.....	43,101 36	.....	43,101 36
Brooklyn, N. Y.....	48,009 03	40,024 70	88,033 73
League Island, Pa.....	30,087 40	12,536 11	42,623 51
Washington, D. C.....	25,042 51	36,279 10	61,321 61
Norfolk, Va.....	107,248 68	2,709 18	109,957 86
Pensacola, Fla.....	4,933 86	340 88	5,274 74
Mare Island, Cal.....	67,904 82	2,468 49	70,373 31
New London, Conn.....	1,499 38	.....	1,499 38
Key West, Fla.....	2,200 20	.....	2,200 20
Total.....	366,409 66	101,368 85	467,778 51

NAVY-YARDS.

This Bureau considers that the suggestions contained in the memorandum of the Navy-Yard Commission, forwarded with the Department's letter of June 23, 1883, are a step in the right direction, towards reducing the large expenditures at the navy-yards, for cost of the maintenance and organization, which does not directly enter into the expenditure for construction or repair of naval vessels, and it has faithfully endeavored to carry out so much as relates to matters under its cognizance, and expects to show a corresponding decrease in its expenditures for said maintenance.

I am of the opinion that the assistant engineer officers who have finished cruises at sea should be utilized to a very much greater extent in our navy-yards, and be ordered, not for clerical services, for which they are not trained especially, but, as far as practicable, to have charge as heads of the several shops for which their profession fits them in the place of the master workman or foreman of such shops, thus dispensing with one very considerable source of expense for yard maintenance, and with but the small increase for their pay as officers on shore-duty rather than on waiting orders. This would not only be a great saving in the cost for organization, but be a practical school for these officers, training them constantly in the line of their profession, in the minuter details of designing, making, and repairing the various parts of machinery, &c., which are used on naval vessels, together with the tools, methods, appliances, &c., for the work.

For obvious reasons, the Bureau would not recommend a general and sweeping change in this direction at once, thereby discharging a large class of skilled and faithful mechanics, but as vacancies occur from time to time that they be filled by these engineer officers.

The Bureau is also of the opinion that there would result a very considerable saving in the expenditures for the making, care, repair, and attendance of the steam generators, and appliances of the several kinds and uses in the navy-yards, if they were all placed under the general charge and control of the engineer officers of the yards, the expenses of each to be paid from the appropriations of the bureaus using the same, as now; thus giving a practical opportunity and possibility to carry out another recommendation of the Navy-Yard Commission, that one general steam-generating establishment be provided in each yard to furnish steam for all motive power and steam-heating purposes, thereby securing "economy of fuel, reduced expense of attendance, and an increase of convenience and efficiency."

The various shops under cognizance of this Bureau at the several navy-yards, with their present equipments and appliances, are in good working order, and equal to any present requirement for repair of engines, boilers, &c., or for the rapid and economical construction of new modern machinery of first-class design and workmanship.

The boiler-shops at New York, Washington, Norfolk, and Mare Island yards have been greatly improved by the addition of a few modern machine tools, and are now producing first-class boilers from very large and heavy steel plates, at a less cost per pound than has ever before been done in our navy-yards, or obtainable under contract.

The large machine for testing the strength of boiler material, &c., for which \$6,000 was appropriated August 5, 1882, was erected in the Washington navy-yard last March, by the Messrs. Fairbanks & Co., and gives complete satisfaction, supplying a long-felt need for the more careful and correct comparative tests of such metals, according to fixed standards, upon a reliable machine.

I beg to respectfully urge that the amounts called for in the estimates for civil establishment herewith submitted may be allowed for each navy-yard which it is decided to keep open, as with the present amount but one clerk can be paid from this appropriation, which is obviously too small a force for all the records, accounts, reports, &c., required of each, and does not provide for the contingencies of absence from sickness or other cause.

PRESENT CONDITION OF MACHINERY OF NAVAL VESSELS WITH THE WORK REQUIRED.

The following will show the present condition and the work required to be done to the engines, &c., of naval steamers to fit them for efficient sea service according to latest reports with an approximate estimate for the cost of the same.

Adams (3d rate).—In service. In fair condition, but will shortly require general overhauling and repair, with new boilers for which material is on hand. (\$65,000.)

Alliance (3d rate).—In service. In fair condition, but will shortly require general overhauling and repair, with new boilers for which material is on hand. The boilers are now in progress of construction at the Norfolk yard. (\$65,000.)

Alert (3d rate).—Repairs, with new boilers, just completed at Mare Island yard. In excellent condition.

Ajax (iron-clad).—In good state of preservation. Would have to be repaired with new boilers for sea-service. (\$40,000.)

Alarm (torpedo ram).—Ready for service.

Brooklyn (2d rate).—General overhauling and repair, new boilers, connected, &c. (\$20,000.)

Catalpa (tug).—In service. Ordinary repairs. (\$2,000.)

Canonicus (iron-clad).—In good state of preservation. Would have to be repaired with new boilers for sea-service. (\$40,000.)

Camanche (iron-clad).—Well preserved. Could be made ready for service at a small expense. (\$2,000.)

Catskill (iron-clad).—Well preserved. To fit for sea-service. (\$2,000.)

Colorado (1st rate).—Put in new boilers and crank shaft (on hand), and thoroughly overhaul and repair machinery. (\$25,000.)

Cohasset (tug).—Thorough repairs nearly completed.

Despatch (4th rate).—In service. In good condition.

Enterprise (3d rate).—In service. In good condition.

Essex (3d rate).—In service. In fair condition, but should soon have general overhauling and repair, with new boilers (material on hand). (\$55,000.)

Fortune (tug).—Repairs, with new boilers, to be completed at Norfolk yard. (\$4,000.)

Franklin (1st rate).—Requires new boilers (now on hand) to be put in, and machinery thoroughly overhauled and repaired. (\$30,000.)

Galena (3d rate).—In service. Repairing at New York yard. (\$10,000.) New boilers should soon be put in hand for this vessel.

Hartford (2d rate).—In service. In good condition.

Iroquois (3d rate).—In service. In good condition.

Intrepid (torpedo ram).—Certain alterations recommended to fit her for gunboat. (\$14,000.)

Juniata (3d rate).—In service. In good condition.

Jason (iron-clad).—Well preserved. To prepare for sea-service. (\$2,000.)

Kearsarge (3d rate).—In service. In fair condition.

Lackawanna (2d rate).—In service. In poor condition and should shortly be thoroughly overhauled and repaired, with new boilers (material on hand). (\$65,000.)

Lancaster (2d rate).—In service. In fair condition.

Lehigh (iron-clad).—In fair state of preservation. To make ready for service. (\$3,000.)

Leyden (tug).—In service. Usual repairs incident to service required. (\$3,000.)

Marion (3d rate).—To complete thorough overhauling and repairs at Portsmouth yard, with new boilers about completed. (\$20,000.)

Mahopac (iron-clad).—In good state of preservation. To fit for service. (\$3,000.)

Manhattan (iron-clad).—In fair state of preservation. To fit for service. (\$4,000.)

Mayflower (tug).—In fair condition. To fit for service. (\$3,000.)

Michigan (4th rate).—In service. Should have thorough overhauling and repair, with new boilers. (\$25,000.)

Minnesota (1st rate).—Requires extensive repairs, and new boilers. (\$75,000.)

Monongahela (2d rate).—Requires thorough overhauling and repair, with new boilers (for which material is on hand at Mare Island yard). (\$65,000.)

Mohican (3d rate).—Work should be continued to completion on new compound engines, &c., at Mare Island yard. (\$75,000.)

Monocacy (3d rate).—In fair condition. Will soon require thorough overhauling and repair, with new boilers. (\$75,000.)

Montauk (iron-clad).—In good condition. Ready for service. Stores and outfit. (\$2,000.)

Monterey (tug).—In service. Will require the incidental repairs necessary from continued service. (\$3,000.)

New York (1st rate).—Requires new machinery (on hand) to be erected on board the vessel at New York yard, and the new boilers (material on hand) completed and put in the vessel. (\$100,000.)

Nipsic (3d rate).—In service. In excellent condition. Thorough repairs just completed.

Nahant (iron-clad).—Well preserved. Ready for service. Stores and outfit. (\$2,000.)

Nantucket (iron-clad).—Well preserved. Ready for service. Stores and outfit. (\$2,000.)

Nina (tug).—Repairs, with new boilers, nearly completed at New York yard.

Omaha (2d rate).—Thorough overhauling and repairs, with new boilers, nearly completed at Portsmouth yard.

Ossipee (3d rate).—Thorough overhauling and repairs, with new boilers, nearly completed at League Island yard.

Powhatan (2d rate).—In service. In fair condition. Will shortly require general overhauling and repair, with new boilers (material on hand for boilers). (\$60,000.)

Pensacola (2d rate).—In service. In fair condition. Will shortly require general overhauling and repair. (\$40,000.)

Plymouth (2d rate).—Requires general overhauling and repair. (\$37,000.)

Palos (4th rate).—In fair condition.

Passaic (iron-clad).—Ready for service. Stores and outfit. (\$2,000.)

Pilgrim (tug).—In service. In good condition. Ordinary repairs incident to continued service required. (\$2,000.)

Pinta (tug).—In service. In good condition. Thorough overhauling and repair, with new boilers, just completed.

Quinnebaug (3d rate).—In service. In bad condition. Now being repaired at Leghorn, Italy, for one year's service, at a cost estimated at \$14,000, after the expiration of which time this vessel should be thoroughly overhauled and repaired, with new boilers. (\$75,000.)

Richmond (2d rate).—In service. In fair condition. Will shortly require thorough overhauling and repair. (\$45,000.)

Ranger (3d rate).—In service. In good condition.

Rescue (tug).—In service. In good condition.

Rocket (tug).—In service. In good condition.

Shenandoah (2d rate).—Thorough overhauling and repair. Ready for sea service, with new boilers just completed at the Boston yard.

Swatara (3d rate).—In service. In fair condition. Will shortly require thorough overhauling and repair, with new boilers. (\$75,000.)

Saugus (iron-clad).—Requires new boilers, and machinery repaired to fit for service. (\$40,000.)

Snowdrop (tug).—In service. In fair condition.

Speedwell (tug).—In service. Ordinary repairs incident to continued service. (\$3,000.)

Standish (tug).—In service. Ordinary repairs incident to continued service. (\$3,000.)

Tennessee (1st rate).—In service. In fair condition. Will shortly require thorough overhauling and repair, with, perhaps, new boilers. (\$85,000.)

Trenton (2d rate).—In service. Thorough overhauling and repair just completed at New York yard.

Ticonderoga (2d rate).—Requires thorough overhauling and repair of machinery; new boilers (material on hand) to be constructed and put in. (\$60,000.)

Tallapoosa (4th rate).—In service. In good condition.

Triana (tug).—Requires thorough repair and new boilers. (\$15,000.)

Vandalia (2d rate).—In service. In fair condition. Requires thorough overhauling and repair, with new boilers (material on hand for new boilers at Norfolk yard). (\$65,000.)

Wabash (1st rate).—Requires to be thoroughly overhauled and repaired, with new boilers (now on hand). (\$30,000.)

Wachusett (3d rate).—In service. Requires thorough overhauling and repair, with new boilers. (\$75,000.)

Wyandotte (iron-clad).—Machinery, &c., well preserved and ready for service.

Yantic (3d rate).—In service. Will require general overhauling and repair. New boilers should be put in. (\$20,000.)

STEEL PLATE FOR STEAM BOILERS.

It is proper in this connection, and in view of the fact that as a large proportion of the cost for repairs, under cognizance of this Bureau, of naval steamers is upon their boilers, to call attention to the manifestly good results already obtained by the use of mild steel instead of iron in boiler construction, and the promise that even better results will be seen by the longer use of boilers made from this material.

Previous to 1879-'80 boilers constructed of iron for the Navy by outside parties and in the navy-yards cost from 27 to 40 cents per pound, including grate bars and other cheap fittings, and, although made from the best iron procurable, would ordinarily require extensive repairs after a full cruise of three years, and very extensive repairs, or entirely new boilers after two such cruises.

With the mild steel now used by the Bureau in the boilers constructed in our navy-yards for naval vessels during the last four years we are making such boilers at an average cost of 20.68 cents per pound (the lowest figures being 17.01 cents, and the highest 23.23 cents per pound), and it is expected that this cost will be further reduced by the use of the improved appliances for handling and working this material which have been put up in several of the navy-yards.

Thus far the Bureau has not had to make repairs of any extent upon boilers made of this material, but sufficient time has not yet elapsed to give them full trial to develop what the ordinary lifetime of such boilers will be.

The *Nipsic*, however, was the first vessel fitted with these steel boilers, and after returning from a cruise of over three years, during which time she steamed some 40,000 knots, her boilers giving most perfect satisfaction in their working, with not \$1 of expense in repairs for the cruise, and after being cleaned and some slight repairs made, were ready, and are now again in service, in first-class condition.

The Bureau considers that the stand which it took, insisting upon a tensile strength not to exceed 60,000 pounds to the square inch, with a ductility in 8 inches of not less than 25 per centum, together with its efforts to reduce to a minimum the possible number of riveted joints, for leaks, corrosion, &c., by demanding and obtaining the largest sheets that could be manufactured, has tended largely to raise the standards of excellence of material and the size of plates as now made by the principal manufacturers of the country, and that the stimulus thus given, with the honorable rivalry and zeal of our principal manufacturers using the superior products of American mines, will yet produce a still better material in maximum sizes of plates and at minimum cost.

DOUBLE-TURRETED MONITORS.

Miantonomoh.—Was fitted at League Island navy-yard, and made a successful run from said yard to the Washington yard, where some defects to her air-pump were remedied, since which time she has made a successful trip to New York yard, where she now is.

During these trips she was loaded in such manner as to bring her down to about the depth and trim that she would necessarily have un-

der the conditions of being regularly equipped for actual service. While coming up the Potomac River, on the run from League Island to Washington, and during some trials over measured distances to determine the slip of her propellers, this vessel made 10.5 knots per hour, with six boilers in use, and it was the opinion of her chief engineer, coincided in by her commander, that with properly-drilled firemen, &c., the vessel could be made to run 11 knots per hour. During these trials there was obtained 1426.5600 Ind. horse-power, with 65 revolutions, 63 pounds steam, and a speed of 10 knots.

The results of the performances of this vessel prove the wisdom of completing the machinery of these monitors on the original plans of the Bureau, as heretofore recommended and urged in the several reports and letters of the Bureau.

Puritan.—This vessel has been successfully launched, and according to agreement with the Department, dated December 29, 1882, this Bureau has paid John Roach the sum of \$8,622.75 for preparing said vessel, in matters pertaining to this Bureau, for launching. A contract was entered into with Mr. Roach for the completion of engines, &c., with certain hull fittings, based upon careful and thorough estimates of the Naval Advisory Board, for the sum of \$410,209.99, and the work is being rapidly progressed with.

Terror.—This vessel has been successfully launched, and according to agreement with the Department dated December 30, 1882, this Bureau has paid William Cramp & Sons the sum of \$6,504.50 for preparing said vessel, in matters pertaining to this Bureau, for launching. A contract was entered into with Messrs. Cramp & Sons for the completion of engines, &c., with certain hull fittings, based upon careful and thorough estimates of the Naval Advisory Board, for the sum of \$208,712.32, and the work is progressing satisfactorily.

Amphitrite.—This vessel has been successfully launched, and according to agreement with the Department dated December 26, 1882, this Bureau has paid the Messrs. Harlan & Hollingsworth Company the sum of \$6,504.50 for preparing said vessel, in matters pertaining to this Bureau, for launching. A contract was entered into with this company for the completion of engines, &c., with certain hull fittings, based upon careful and thorough estimates of the Naval Advisory Board, for the sum of \$208,712.32, and the work is progressing satisfactorily.

Monadnock.—This vessel has been successfully launched, and according to agreement with the Department dated February 24, 1883, this Bureau has paid Phineas Burgess the sum of \$36,709.79 for preparing said vessel, in matters pertaining to this Bureau, for launching. The boilers for this vessel are on hand at the Mare Island navy-yard.

To complete the engines, &c., with certain hull fittings in all respects similar to the before-mentioned monitors, ready for sea-service, it will require, according to the Naval Advisory Board estimates, the further expenditure of \$216,006.82.

NEW STEEL CRUISERS.

Chicago.—4,500-ton cruiser.

Boston.—3,000-ton cruiser.

Atlanta.—3,000-ton cruiser.

Dolphin.—Dispatch boat.

The plans prepared by this Bureau for machinery for the Boston and Atlanta, and those as modified by the Bureau for the Chicago, together with those for the Dolphin, with the specifications for the same pre-

pared by the Bureau, were all approved by the Naval Advisory Board, and said machinery, together with the hulls, are in progress of construction by John Roach, of New York, on contracts with the Department, and under the inspection and supervision of the Naval Advisory Board.

As one of the above cruisers (Chicago) is designed to take the place of vessels of the Trenton class, which is one of the best types of vessels recently built for the United States Navy, it is believed to be of interest and value for purposes of future reference and comparison to give at this time full and complete data of the performances of this vessel, which is done in the accompanying report.

PERSONNEL OF THE ENGINEER CORPS.

In this connection I trust that I may be pardoned for quoting at length what was so well and ably said upon this subject, in the last annual report of this Bureau, by the then engineer in chief, William H. Shock, U. S. N., who was retired for age, by law, from the active list of the Navy, and as chief of this Bureau, on the 15th of June last.

I feel that his views and opinions derived from his long and wide practical experience, extending over the forty years of his active service as an engineer officer of the Navy, some six years of which were spent as head of this Bureau, together with his well-known integrity, candor, zeal, and wide-awake progressiveness in all matters pertaining to his profession and his corps, should command the most careful attention and thoughtful consideration from every one who may be called upon to pass judgment upon the subject, and this shall be my excuse for quoting so largely from the last annual report made by this officer, as follows:

In this connection I beg most respectfully to call attention to some of the provisions of the act making appropriations for the naval service approved August 5, 1882, and to place upon record my earnest objections thereto, particularly with reference to so much of the act as makes the sweeping reduction of 50 per cent. of the working force of the Engineer Corps.

Of the 163 passed and assistant engineers on the list January 1, 1882, 96 were at sea. This number, in my judgment, is not too many to insure the safety and maintain the efficiency of the steam machinery of the Navy now afloat. The act allows only 60 passed and 40 assistant engineers.

With this reduced number, and with the same number of United States naval steamers in commission as at present, there would be an average of a little less than three watch engineers to each ship in commission; but as reliefs have to be provided for those at sea, and allowance made for sickness, &c., the Department could not assign more than one passed or one assistant engineer to each ship at sea.

There is not, to my knowledge, a single ocean steamer in the merchant marine to-day that is allowed only one assistant engineer, and when this reduction is fully made as contemplated by said act, its result can only be a great want of efficiency, the imperilment of lives and public property, and a very largely increased expenditure for repairs to boilers and machinery.

Some provision must be made for the care and management of the steam machinery of the Navy, as it is physically impossible to keep officers of the Engineer Corps at sea continuously, and equally impossible for one assistant to perform all the duties required of an engineer in the engineer department of a war steamer.

The only recourse must necessarily be the employment of mechanics or machinists, so called. Such a system, after a trial of eleven years in our Navy, had to be abandoned, for the reason that competent respected mechanics could not be found, and with such as were obtained the record shows that the repairs required to machinery were numerous and extensive, often involving the expenditure of large sums of money. Every inducement was held out to secure and retain good men; their pay was increased from \$55 a month to \$61.50, then to \$76.50, the latter but little less than the pay of the educated cadet engineer; but all to no purpose, for none, with a few rare exceptions, except the idle or the intemperate, would enlist, and in the case of the exceptions noted many availed themselves of the first opportunity and obtained their discharge.

It must also be borne in mind in considering the machinist system that the United States has no large merchant steam marine like Great Britain from which to draw a supply of machinists thoroughly trained in the duties of the engine-room. It has been asserted that the engineer department of the British navy is managed upon this principle. This is not strictly true; but granting it for the present, it must be remembered that the social system prevailing in Great Britain is vastly different from that in the United States. In the former country the laborer, the mechanic, the artist, and the merchant are educated from childhood in the belief that those in official positions in the army and navy and nobility are of gentle blood, a higher race of beings than themselves, occupying a plane whose level they never can attain. Not so in the United States. Here every boy is taught that he is a possible President, and the intelligent, educated American mechanic is not less ambitious than his fellow-men in other walks of life in his efforts to elevate himself and family in rank or standing among them.

Whenever Congress says to the laboring and mechanical classes of this country that, whatever your merits may be, you cannot, shall not, rise above the social scale in which you were born, and this declaration is acquiesced in by the public, then, and not till then, will the Navy be able to obtain such a class of skilled mechanics by enlistment as is easily to be had in England and other monarchical countries.

As is stated above, the machinist system does not prevail in the British service to the extent that this act will render necessary in our naval service, as will be seen from the fact that in June, 1881, there were one hundred and thirty-six engineers on the list, which gives a little more than six engineers to each ship in active service, or about double the number that said act will allow to each ship in active service in our Navy.

I respectfully submit that, while it is contemplated to complete one or more of the monitor vessels, requiring from five to seven engineers to each, as well as to build new steamers, any reduction in the number of engineer officers will be detrimental to the best interests of the Government.

I therefore respectfully recommend that Congress may be asked to so far modify the act approved August 5, 1882, in relation to the number of assistant engineers on the active list, as to allow the number provided for under act approved March 3, 1871, that is, one hundred passed assistant engineers and one hundred assistant engineers, with the relative rank for each as now fixed by law.

The difficulty of securing engineer officers for each ship in service has already made itself very seriously felt. With the number of assistant engineers fixed by the act approved August 5, 1882, it is impossible to properly officer our ships in the engineering department.

To intrust the watches to the young naval cadets, except they may have had thorough and special training therefor, or to the present finishers, is but to invite disaster; and the occurrence of some great calamity can only be a question of time.

Were our merchant steamers to leave port similarly officered the underwriters would refuse to insure, and the owners would be liable to criminal prosecution.

If the lives of the officers and men of our Navy are of little consequence, or if the care of the machinery of our vessels of war is of small importance, then such a system needs no criticism.

Steps should be at once taken to provide adequate professional supervision for our steam machinery, for the proper protection and preservation of lives and property, or the consequence of neglect must be accepted.

In conclusion, it may be remarked that our Government was the first to discover the advantages of special technical education for its naval engineer officers, and the establishment of the cadet-engineer system at Annapolis was the sequence.

Conservative England, with its existence depending upon the efficiency of its navy, speedily followed, and its training-school for naval engineers has been fostered and encouraged by all possible means.

Thus, while other Governments, alive to the necessity of maintaining a naval supremacy, establish and cherish special technical schools for the training of its engineer officers, the Navy of the United States, after

thoroughly preparing and equipping its naval academy with all the varied appliances for the instruction and training of young men for this so important special service, with its high grade of requirements for entering, and standard required for graduation, presents the extraordinary spectacle of retrograding to a system, or lack of system, of twenty years ago; a measure that excites the surprise and unfavorable criticism of the progressive educators of the country; and one which, even if it may tend to make the service more homogeneous, will certainly result in also making it inefficient.

A parallel might be supposed if our large universities were to abolish their special scientific and medical schools, and, without adding anything to their curriculum, except perhaps a little rudimentary mechanics and physiology, confer degrees in arts, medicine, and science.

Further, I respectfully invite attention to the last annual report of the Bureau upon this subject.

ESTIMATE OF APPROPRIATIONS.

I have the honor to submit herewith the annual estimates of this Bureau for the fiscal year ending June 30, 1885.

Very respectfully,

W. H. H. SMITH,
Acting Chief of Bureau.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Steam Engineering, Navy Department.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
SALARIES.		
Chief clerk, March 3, 1883	\$1, 800 00	\$1, 800 00
Chief draftsman, same act ..	2, 250 00	2, 250 00
Assistant draftsman, same act	1, 400 00	1, 400 00
One clerk of class two, same act.....	1, 400 00	1, 400 00
One clerk of class one, same act.....	1, 200 00	1, 200 00
Submitted to promote this clerk to class two (submitted). This submission is eminently just and proper, and should be allowed, as the clerk, whose salary it is hereby proposed to raise to \$1,400 per annum, performs faithfully and well the clerical duties, which in other Bureaus and Departments receive a salary of from \$1,600 to \$1,800 per annum.	200 00	.....
One clerk of class one (March 3, 1883).....	1, 200 00	1, 200 00
One clerk, same act	1, 000 00	1, 000 00
One assistant messenger, same act	720 00	720 00
Two laborers, same act.....	1, 320 00	1, 320 00
	12, 490 00	12, 290 00
CONTINGENT.		
For stationery and miscellaneous items (March 3, 1883).....	1, 500 00	1, 000 00

Estimates of appropriations required for the service, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
CIVIL ESTABLISHMENT.		
Portsmouth, N. H., navy-yard:		
One clerk to chief engineer.....	\$1,400 00	
One store clerk.....	1,300 00	
	\$2,700 00	.....
Boston, Mass., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One store clerk.....	1,300 00	
	2,700 00	.....
Brooklyn, N. Y., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One clerk.....	1,300 00	
One store clerk.....	1,300 00	
	4,000 00	.....
League Island, Pa., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One store clerk.....	1,300 00	
	2,700 00	.....
Washington, D. C., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One store clerk.....	1,300 00	
One writer.....	1,017 25	
	3,717 25	.....
Norfolk, Va., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One store clerk.....	1,300 00	
	2,700 00	.....
Pensacola, Fla., navy-yard:		
One writer.....	1,017 25	
	1,017 25	.....
Mare Island, Cal., navy-yard:		
One clerk to chief engineer.....	1,400 00	
One store clerk.....	1,300 00	
	2,700 00	.....
	22, 50	\$10,019 00
STEAM MACHINERY FOR STEEL CRUISERS.		
For completion of steam machinery, boilers, &c., with necessary fittings, &c., for the sea-service of steel cruisers and dispatch boat under contract with John Roach, as per act approved March 3, 1883:		
United States steel cruiser Chicago, March 3, 1883.....	220,000 00	
United States steel cruiser Boston, March 3, 1883.....	155,000 00	
United States steel cruiser Atlanta, March 3, 1883.....	155,000 00	
United States steel dispatch boat Dolphin, March 3, 1883.....	90,000 00	
	620,000 00	*377,000 00
This appropriation to be made immediately available from the passage of the act appropriating the same.		
STEAM MACHINERY.		
For completion of new machinery, boilers, &c., for the U. S. S. New York, at New York navy-yard (submitted).....	100,000 00	
For repairs, completion, and preservation of machinery and boilers, including steam steerers, steam capstans, steam windlasses, &c., in vessels on the stocks, in ordinary, &c.; purchase and preservation of all materials and stores; purchase, fitting, and repair of machinery and tools in the navy-yards and stations; wear, tear, and repair of machinery and boilers of naval vessels; incidental expenses for naval vessels, yards, and Bureau, such as foreign postages, telegrams, advertising, publishing reports of tests and experiments, freight, photographing, books, stationery and instruments, &c., appropriated March 3, 1883.....	1,200,000 00	1,000,000 00
CONTINGENT.		
For drawing materials, instruments, &c., for the drafting rooms, appropriated March 3, 1883.....	1,000 00	1,000 00

* This amount designated by the Secretary of the Navy to be expended by this Bureau for machinery of these vessels from the appropriation of \$1,300,000.

STATISTICS AND PERFORMANCE OF THE UNITED STATES SCREW STEAMSHIP TRENTON.

NEW YORK NAVY-YARD, *October 25, 1883.*

SIR: In accordance with a request made by the late Chief of the Bureau of Steam Engineering in the Navy Department, previous to his retirement, the undersigned have prepared for the information of that Bureau in the following pages all the facts extant relating to the statistics and performance of the United States screw steamship Trenton. These facts embrace the dimensions of the hull and machinery, a description of the same, a synopsis of the performance of the vessel at sea under the conditions of ordinary cruising, and for the two cases of under steam alone and under steam and sail combined, between the dates of the 18th of October, 1877, when the vessel was commissioned for the first time, and the 17th of September, 1881, immediately on returning from a cruise to the Mediterranean, since which time no steaming has been done. Additionally, there are given the special trials of the vessel and machinery, made to determine the maximum speed, the cost of the power in pounds of coal consumed per hour, &c. There are also given from the data thus collected, such deductions and inferences as they seem to warrant, and which may be profitably applied in designing the hulls and machinery of later vessels for the Navy.

The steam record of the Trenton was very accurately kept, the columns of the tabular log containing an entry every hour during steaming of the course and speed of the vessel, the direction and force of the wind, the steam pressure in the boiler and receiver, the position of the throttle-valve, the point at which the steam was cut off in the cylinders, the vacuum in the condenser and the height of the barometer, the temperatures of the air on deck and in the engine-room, the temperatures of the refrigerating or sea water, of the discharge water, and of the feed water, the weight of coal consumed and the weight of refuse from the same, &c. For each day of steaming a set of indicator diagrams was taken from each end of each cylinder and pasted in the steam log. The vessel's draught of water forward and aft was observed and entered in the steam log on each leaving and arriving in port, together with the weight of coal on board.

A synopsis of the whole of this record, without the omission of an hour, has been carefully made; and every indicator diagram has been accurately computed.

For the special speed trials the indicator diagrams were taken from each end of each cylinder every fifteen minutes, and all the other necessary data were observed and noted at the same periods.

The vessel was fitted with steam capstans and steam steering apparatus. All the appointments were of the latest type.

The engineer *personnel* consisted of one chief engineer, two passed assistant engineers, one assistant engineer, two cadet-engineers, five machinists, eighteen first-class firemen, eighteen second-class firemen, and twenty-four coal-heavers.

Including the engineer *personnel*, the vessel as a flagship carried about 450 shipped men and 30 officers.

The coal bunkers contained 13,966 cubic feet and were located behind the boilers, lying between the latter and the sides of the vessel. The length occupied in the vessel by the bunkers was a little greater than the length occupied by the boilers, and they extended in unbroken space from the bottom of the vessel to the gun-deck.

The Trenton is an enlarged copy of the United States steam frigate Lancaster, having about one-sixth more displacement. The forms of the immersed solids of the two vessels are almost precisely the same. The Lancaster was a full sail powered frigate with auxiliary steam power capable of giving her a maximum speed under steam alone in smooth water and calm air of barely 8 geographical miles per hour. As the vessel was intended to do her cruising almost entirely under sail alone, the steam being used only for calms, and for entering and leaving port, the screw was two-bladed and lifted out of water.

The Lancaster was built in 1858-'59 from the plans of Naval Constructor John Lenthall, and, for her type, was as near perfection as possible; but that consummate naval architect presented quite different designs when called on later for full steam-powered vessels with high speed in which the sails were merely auxiliary. The maximum speed of the Lancaster under sails and steam combined was scarcely 11 geographical miles per hour, and for that speed with sails as the principal motor the model of the vessel was admirably adapted. Her maneuvering and working qualities in a sea-way and under sail alone were wonderfully fine. She was, in fact, primarily a sailing vessel, and only in a secondary sense a steamer.

HULL.

The hull of the Trenton is of wood, coppered, and frigate built, with gun-deck and with spar-deck. The vessel is ship-rigged and fitted with a bronze ram or spur bolted to the bow and projecting $9\frac{1}{2}$ feet from the stem. The following are the principal dimensions and proportions:

Extreme length over all	271 feet 6 inches.
Length on load water line from forward edge of rabbet of stem to after side of body stern-post	253 feet.
Greatest molded breadth on load water line	46 feet 10 inches.
Extreme breadth on load water line	48 feet.
Depth from load water line to lower edge of rabbet of keel at middle of the length on the load water line	18 feet 6 inches.
Depth of keel below the lower edge of its rabbet, forward	1 foot 8 inches.
Depth of keel below the lower edge of its rabbet, at middle of the length on the load water line	2 feet 2 inches.
Depth of keel below the lower edge of its rabbet, aft	2 feet 8 inches.
Mean deep load draught of water	20 feet 8 inches.
Area of the greatest immersed transverse section	735 square feet.
Area of the deep load water section	9,576 square feet.
Displacement per inch of draught at the deep load water section	22.8444 tons.
Displacement to deep load draught (34.932 cubic feet per ton) ..	3,814.4000 tons.
Ratio of the greatest immersed transverse section to its circumscribing parallelogram	0.8277
Ratio of the deep load water section to its circumscribing parallelogram	0.7885
Ratio of the displacement to its circumscribing parallelepipedon	0.5931
Ratio of the displacement to a solid having the hull's greatest immersed transverse section for base, and its load water line from forward edge of rabbet of stem to after side of body stern-post for length	0.7165
Ratio of length to the extreme breadth, on the load water line ..	5.2708
Surface of keel	1,372.95 square feet.
Surface of stem and ram	294.06 square feet.
Surface of rudder	222.28 square feet.
Surface of rudder-post	88.56 square feet.
Surface of the body of the hull from the forward edge of the rabbet of the stem to the after side of the body stern-post, and from the lower edge of the rabbet of the keel to the deep load water line	14,654.28 square feet.

Total immersed external or wetted surface of hull	16,632.13 square feet.
Periphery of the deep load water section	528 feet.
Angle of dead rise at greatest immersed transverse section....	6½ degrees.
Half angle of bow at deep load water section	24½ degrees.
Half angle of stern at deep load water section	40½ degrees.
Half angle of bow at water section 10 feet above lower edge of rabbet of keel	20½ degrees.
Half angle of stern at water section 10 feet above lower edge of rabbet of keel	20¼ degrees.
From lower edge of rabbet of keel to top of keel	8 inches.
Throats of floors	1 foot 5 inches.
Depth of hold to berth-deck beams	14 feet 6 inches.
Berth-deck beams molded	1 foot 1 inch.
Berth-deck plank	4 inches.
Height to gun-deck beams	6 feet 2 inches.
Gun-deck beams molded	1 foot 3 inches.
Gun-deck plank	5 inches.
Height from lower edge of rabbet of keel to top of gun-deck plank at center of vessel	25 feet 10 inches.
Deduct spring or camber of gun-deck beams in 46 feet	5 inches.
Height from lower edge of rabbet of keel to top of gun-deck plank at side of vessel	25 feet 5 inches.
Port sill above gun-deck plank	1 foot 8 inches.
Port sill above lower edge of rabbet of keel	27 feet 1 inch.
Port sill above deep load water line	8 feet 7 inches.
Depth of port	8 feet 8 inches.
From upper side of port to lower side of spar-deck beams	1 foot 3 inches.
Spar-deck beams molded at side	8½ inches.
Spar-deck plank	4 inches.
Lower side of plank sheer above spar-deck plank	1 foot ½ inch.
Height of plank sheer above lower edge of rabbet of keel	34 feet 1 inch.
Depth of plank sheer	5½ inches.
Top of plank sheer above lower edge of rabbet of keel	34 feet 6½ inches.
Width of opening for the screw between the body stern-post and the rudder-post	7 feet.
Weight of hull alone	1,650 tons.
Area of surface in the ten principal sails	22,226 square feet.
Square feet of sail surface per square foot of greatest im- mersed transverse section	30.2394
Square feet of sail surface per square foot of deep load water section	2.3210
Square feet of sail surface per ton of displacement	5.8269

ARMAMENT.

The battery on the gun-deck consists of eight 8-inch diameter rifled guns. On the spar-deck are three 8-inch diameter rifled guns, two 20-pounder breech-loading rifled bronze guns, two 12-pounder howitzers, one 3-inch diameter breech-loading howitzer of 500 pounds, one 3-inch diameter breech-loading howitzer of 350 pounds, and one long Gatling gun.

The 8-inch diameter guns weigh 17,300 pounds each. The carriages of the three on the spar deck weigh 8,700 pounds each, and the carriages of the eight on the gun-deck weigh 75,137 pounds in the aggregate.

The total weight of the armament is as follows:

	Pounds.
Eleven 8-inch diameter guns	190,300
Carriages for same	101,237
Howitzers, equipments, &c	13,307
Small arms, &c	6,905
Magazine stores	50,452
Torpedoes	6,408
Books and miscellaneous	511
Total ammunition	276,000
	645,120=288 tons.

ENGINE.

There is one horizontal back-acting condensing compound engine, composed of three cylinders, one small one and two large ones placed side by side with the small one between the large ones, which latter are duplicates. All the cylinders are steam jacketed on sides and ends. The steam from the small cylinders is exhausted simultaneously into receivers between it and the adjacent large cylinders.

The main steam valves of all the cylinders are horizontal double ported slides without vacuum rings on their backs or other pressure-relieving device, and work consequently with the full valve-chest pressure upon them. Those for large cylinders are in halves, side by side, each half being worked by its separate valve-stem, the purpose being to make them more easily handled than if they were in one. The large cylinders have no independent cut off or expansion valves, the cutting off being effected by lap on the steam side, with sufficient lap on the exhaust side to give a proper cushioning. The small cylinder has an adjustable independent expansion valve on the back of the main steam valve which is in one. The main steam valve of each cylinder is worked by two eccentrics and the Stephenson Link. The cut-off valve of the small cylinder is worked by a separate eccentric. All the valves receive their movement from the arms of rock-shafts. The thickness of the metal of all the cylinders and of their jackets is $1\frac{1}{2}$ inches, and the steam-space between is $1\frac{1}{2}$ inches wide. The depth of the heads of the small cylinder is $8\frac{1}{2}$ inches; they are double-shell, the inner one being $1\frac{1}{2}$ inches thick and the outer one $1\frac{3}{4}$ inches. The heads of the large cylinders are 11 inches deep; they are double-shell and have the same thickness of metal as the heads of the small cylinder.

Immediately in front of the cylinders, and on the opposite side of the crank-shaft, are two channel plates, each containing two air pumps, together with their valve-chests, reservoirs, and connecting passages, the valve-chest covers being in the end passages of the engine-room. On the top of the channel plates are the guides for the main cross-heads of the three cylinders.

Each of the large cylinders has two piston-rods, one of which passes over and the other under the crank-shaft, both being secured into the same cross-head. The small cylinder has but one piston-rod, which is secured into a cross-tail working on guides between the cylinder and crank-shaft. From the cross-tail to the cross-head proceed two side-rods, one passing over and the other under the crank-shaft. This arrangement requires considerably more space than in the case of two piston-rods between the cylinder and crank-shaft; consequently the small cylinder is pushed farther outboard than the two large ones by the difference of this space.

There are two horizontal double-acting air-pumps, one in each channel plate, and they are worked direct from arms forged on the lower piston-rods of the large cylinders. The feed-pumps and bilge-pumps, two of each, are horizontal and single-acting. The feed-pumps are worked direct from arms forged on the upper piston-rods of the large cylinders. The bilge-pumps are worked direct from arms forged on the side-rods of the small cylinder.

There are two surface condensers with shells of $1\frac{1}{4}$ inches thick metal, one placed above each channel plate, so that the cross-heads move between the channel plates and condensers; the condensers, however, are connected, the two shells being merely for convenience of construction. The condensing surface consists of brass tubes, seamless and tinned,

made tight at each end into cast-iron tube plates by means of wooden cylinders. The outboard end of each condenser is divided by a vertical partition into two water compartments, the inboard end consists of one water compartment. The injection or refrigerating water is received into one of the outboard compartments which extends from top to bottom of the condenser, and from this compartment it passes through one-half the number of tubes into the inboard compartment, whence it returns through the remaining half number of tubes to the other outboard compartment and thence overboard. The exhaust steam surrounds all the tubes simultaneously.

The injection water is supplied by two centrifugal water circulating-pumps of 4 feet outside diameter, with a suction pipe of 12 inches diameter at the center of one side; one pump to each condenser. Both pumps are upon one shaft, which is driven by two vertical independent steam cylinders of $11\frac{1}{2}$ inches diameter and 9 inches stroke of piston, using steam without expansion. The pumps and their driving cylinders are placed between the condensers and the adjacent side of the vessel. There are two injection valves and two outboard delivery valves. One of each to each condenser.

The crank-shaft is a "built-up" shaft, the cranks being forged separately from the shaft, which is in short lengths, upon which the cranks are secured. The crank-pins are likewise forged separately and secured into the cranks.

The following are the principal dimensions of the engine :

Number of cylinders	3
Diameter of the small cylinder	$58\frac{1}{2}$ inches.
Diameter of the piston-rod of the small cylinder.....	8 inches.
Net area of the piston of the small cylinder, exclusive of its rod.....	2,662.7023 square inches.
Stroke of the piston of the small cylinder	48 inches.
Space displacement of the piston of the small cylinder per stroke	73.9640 cubic feet.
Space in the clearance and steam-passage at one end of the small cylinder.....	5.9456 cubic feet.
Fraction which the space in the clearance and steam passage at one end of the small cylinder is of the space displacement of its piston per stroke.....	0.080385.
Length of the steam-ports of the small cylinder	36 inches.
Breadth of the steam-ports of the small cylinder (two at each end).....	$3\frac{1}{2}$ inches.
Aggregate area of steam-ports at one end of small cylinder	252 square inches.
Area of exhaust-port of small cylinder (36 by 8 inches).	288 square inches.
Diameter of the large cylinders (two in number)	78 inches.
Diameter of the piston-rods of the large cylinders (two to each cylinder).....	$6\frac{1}{2}$ inches.
Aggregate net area of the pistons of the two large cylinders, exclusive of their piston-rods	9,490.3810 square inches.
Stroke of the pistons of the large cylinders.....	48 inches.
Aggregate space displacement of the pistons of the two large cylinders, per stroke.....	263.6216 cubic feet.
Aggregate space in the clearances and steam-passages at one end of both the large cylinders	15.3114 cubic feet.
Fraction which the space in the clearances and steam passages at one end of both the large cylinders is of the space displacement of their pistons per stroke....	0.058081.
Length of steam-port of the large cylinders	70 inches.
Breadth of steam-port of the large cylinders (two at each end of each cylinder).....	$1\frac{3}{8}$ inches.
Aggregate area of steam-ports at one end of each large cylinder	254 square inches.
Ratio of the aggregate space displacement of the pistons of the two large cylinders, per stroke, to the space displacement of the piston of the small cylinder	3.5641915.

Number of surface condensers	2
Number of tubes in each condenser	3, 772
Outside diameter of condenser tubes	$\frac{5}{8}$ inch.
Length of condenser tubes between plates	72 inches.
Aggregate area of condensing surface in both condensers	8, 640. 7090 square feet.
Number of air-pumps (double-acting)	2
Diameter of air-pumps	16 inches.
Diameter of air-pump piston-rod, over brass casing	$3\frac{1}{4}$ inches.
Strokes of air-pump pistons	48 inches.
Aggregate space displacement per stroke of the two air-pump pistons	10. 9397 cubic feet.
Number of feed-pumps (single-acting)	2
Diameter of feed-pumps	5 inches.
Stroke of feed-pump plungers	48 inches.
Aggregate space displacement per stroke of the two feed-pump plungers	1. 0908 cubic feet.
Number of crank-shaft journals	4
Diameter of crank-shaft journals	$17\frac{1}{2}$ inches.
Length of crank-shaft journals:	
Forward and after journals	$27\frac{1}{2}$ inches.
The two central journals	38 inches.
Number of crank-pin journals	3
Diameter of crank-pin journals	15 inches.
Length of crank-pin journals	22 inches.
Diameter of cross head journal	10 inches.
Length of cross-head journal	14 inches.
Length of connecting-rods between centers	9 feet.
Diameter of necks of connecting-rods:	
Crank-pin end	$9\frac{1}{2}$ inches.
Cross-head end	8 inches.
Diameter of line-shaft journals	18 inches.
Length of line-shaft journals:	
Forward journal	36 inches.
After journal	24 inches.
Width of all steam-pistons	15 inches.
Width of packing rings in all steam-pistons	$11\frac{1}{2}$ inches.
Number of thrust collars on line shaft	17.
Inside diameter of thrust collars	18 inches.
Outside diameter of thrust collars	23 inches.
Diameter of the hub of the cranks	$31\frac{1}{2}$ inches.
Depth of the hub of the cranks	$16\frac{1}{2}$ inches.
Diameter of the boss of the cranks	$27\frac{1}{2}$ inches.
Depth of the boss of the cranks	10 inches.

BOILERS.

There are eight cylindrical boilers placed on opposite sides of a fire-room in the fore and aft direction of the vessel; the floor of the fire-room being 10 feet wide. Four boilers are placed on each side, those on one side facing those on the other. The gases of combustion from all the boilers are discharged into one telescopic chimney whose axis is over the center of the fire-room. There are no steam-drums, their places being supplied by two lengths of horizontal steam-pipe 15 inches in inside diameter, one length over the other, lying within and extending the whole length of the uptakes of the boilers on each side of the fire-room. These pipes are of plate-iron, and their surfaces are, of course, steam-superheating surfaces; to furnish sufficient space for them, the upper portion of the uptakes have to be enlarged, so that the width which between the bottoms of the opposite boilers was 10 feet, is narrowed to 4 feet between the uptakes, whose projection at top from the front of the boilers is 3 feet. The least space between the two central boilers on the same side of the fire-room is 8 inches; and the least space between the end boilers and the adjacent ones is 20 inches, to give access behind them. The length in the vessel occupied by the boilers is 52 feet, and the breadth including the fire-room is $30\frac{1}{2}$ feet.

The shell of each boiler is a right cylinder 12 feet in diameter and 10 feet

3 inches in length. The plates of the cylindrical portion are of $\frac{1\frac{3}{8}}{16}$ inch thick iron with double-riveted lap joints. The front end is of $\frac{1\frac{3}{8}}{16}$ inch thick iron with double-riveted lap joints, and the back end is of $\frac{5}{8}$ inch thick iron. The back lower angle of the shell is rounded with a quadrantal arc of 23 inches radius.

Each boiler contains three cylindrical furnaces of 8 feet $1\frac{5}{8}$ inches extreme length, and 3 feet inside diameter. Each furnace contains a grate 6 feet 11 inches in length by a mean breadth of 2.96385542 feet making a grate surface of 20.50 square feet. At the back of the grate is a brick bridge wall 9 inches thick, extending 9 inches high above the top of the grate, which is 1 foot $7\frac{1}{2}$ inches below the crown of the furnace at the front and 1 foot $9\frac{1}{2}$ inches at the back, making an inclination of 2 inches in its length of 6 feet 11 inches. The thickness of the furnace metal is $\frac{9}{16}$ inch. The least water space between the furnaces and between them and the boiler shell is 6 inches including thicknesses of metal.

Each furnace has a separate back smoke connection $19\frac{7}{16}$ inches in the clear, lengthwise the boiler. The least water space between the connections, and between them and the shell, is 6 inches, including thicknesses of metal. All the flat surfaces are socket-bolted every 7 inches; thickness of metal of back smoke connections, $\frac{5}{8}$ inch.

From the back smoke connection to the uptake there are returned for the central furnace of each boiler sixty tubes, and for each wing or side furnace sixty-one tubes, making one hundred and eighty-two tubes for each boiler. All the tubes are of seamless brass, $3\frac{1}{4}$ inches in outside diameter, 3 inches in inside diameter, and 8 feet in length between the tube plates. The distance between the axes of the tubes vertically is $4\frac{1}{2}$ inches, and horizontally $4\frac{5}{8}$ inches. The axes of the tubes of the top row for all the furnaces are in the same horizontal plane.

The uptake is of sheet-iron, and its bottom projects 9 inches from the front of the boiler; thence it inclines outward as it ascends, until at a height of 4 inches above the top of the tubes it projects 30 inches. Above this point it is rectangular in cross-section, 36 inches wide and 51 inches high, containing the two steam superheating pipes. The uptake is in common for the four boilers on each side of the fire-room.

The chimney at its smallest section is 9 feet 6 inches in diameter, and has a height at full lift of 59 feet 8 inches above the mean level of the grates.

The following are the principal dimensions and proportions of the boilers:

Number of boilers.....	8
Diameter of boilers.....	12 feet.
Length of boilers.....	10 feet 3 inches.
Total number of furnaces.....	24
Diameter of furnaces.....	3 feet.
Length of furnaces.....	8 feet $1\frac{5}{8}$ inches.
Length of grates.....	6 feet 11 inches.
Breadth of grates.....	2.96385542 feet.
Total area of grate surface.....	492 square feet.
Total number of tubes.....	1,456
Outside diameter of tubes.....	$3\frac{1}{4}$ inches.
Inside diameter of tubes.....	3 inches.
Length of tubes in clear of tube plates.....	8 feet.
Least diameter of chimney.....	9 feet 6 inches.
Height of chimney above grates.....	59 feet 8 inches.
Total cross-area for draft above bridge walls.....	52.0000 square feet.
Total cross-area for draft through the tubes.....	71.4714 square feet.
Cross area of least section of chimney.....	70.8823 square feet.
Heating surfaces in all the furnaces.....	1,009.6608 square feet.
Heating surfaces in all the back smoke connections.....	1,375.0000 square feet.
Heating surfaces in all the tubes, calculated for their inner diameter.....	9,148.3392 square feet.

Heating surfaces in the uptakes	365.0000 square feet.
Total water-heating surface in the eight boilers.....	11,895.0000 square feet.
Number of steam superheating pipes.....	4
Outside diameter of steam superheating pipes.....	1 foot 3½ inches.
Length of steam superheating pipes	48 feet.
Superheating surface in all the steam superheating pipes...	779.1168 square feet.
Superheating surface in all the boiler shells.....	185.8832 square feet.
Total steam superheating surface.....	965.0000 square feet.
Steam room in the shells of all the boilers.....	2,004.3968 cubic feet.
Steam room in the steam superheating pipes	235.6032 cubic feet.
Total steam room	2,240.0000 cubic feet.
Total water room in all the boilers	4,200.0000 cubic feet.
Square feet of water-heating surface per square foot of grate surface	24.1770
Square feet of steam superheating surface per square foot of grate surface.....	1.9614
Square feet of grate surface per square foot of cross area above bridge walls.....	9.4615
Square feet of grate surface per square foot of cross area of tubes	6.8839
Square feet of grate surface per square foot of cross area of chimney	6.9411
Greatest height of steam room in shells	3 feet 3 inches.

SCREW.

One bronze screw of the Hirsch form, fixed and four-bladed. Each blade, when viewed in projection on a plane parallel to the axis of the screw, has its center radial line perpendicular to that axis, with both its edges symmetrical on opposite sides of that line. The length of the blade at the periphery in the direction of the axis is 1 foot, and at the hub 3.5 feet, the edges of the blade tapering gradually from hub to periphery. The screw has an expanding pitch, increasing gradually from the front to the back edge of the blade in the direction of the axis, but the pitch is uniform radially. Thickness of the blade at the fillet of the hub, 8½ inches. The finished weight of the screw was 26,422 pounds.

The following are the dimensions of the screw :

Diameter of the screw.....	19 feet 6 inches.
Diameter of the hub.....	3 feet.
Number of blades	4
Initial pitch	23.35 feet.
Final pitch	27.35 feet.
Geometrical mean pitch	25.35 feet.
Mean pitch in function of propelling efficiency	26.50 feet.
Length of the screw at periphery in direction of its axis.....	1 foot.
Length of the screw at the hub in direction of its axis.....	3 feet 6 inches.
Mean fraction used of the geometrical mean pitch.....	0.290745.
Helicoidal area of the blades.....	113.4541 square feet.
Projected area of the blades on a plane at right angles to axis..	84.7753 square feet.

WEIGHTS OF THE MACHINERY.

BOILERS AND APPURTENANCES.

	Pounds.
Wrought iron in boilers, including superheaters, uptakes, doors, and plates..	579,000
Wrought iron in telescopic chimney	32,400
Wrought iron in fire tools	1,500
Cast iron in grate-bars and bearers	30,500
Cast iron in valve chambers.....	5,850
Brass in safety, feed, blow, stop, and Kingston valves, gauges, &c	1,750
Brass tubes in boilers.....	105,000
Lead in boiler covering, safety-valve weights, &c.....	19,850
Felt covering of boilers, paint, putty, and gum	20,000
Water in boilers.....	272,150
Total	1,068,000

MOTIVE ENGINE TO AFTER END OF CRANK-SHAFT.		Pounds.
Wrought iron.....		272, 050
Steel		1, 450
Cast iron		441, 200
Brass		86, 100
Copper piping		38, 550
Lagging, paint, putty, and gum		1, 650
Water in condensers		21, 800

Total	862, 800
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LINE SHAFTING, SCREW, PILLOW-BLOCKS, STERN-BEARING, ETC., FROM AFTER END OF CRANK-SHAFT TO PROPELLER, INCLUSIVE.

Wrought iron	83, 350
Cast iron	41, 850
Brass	58, 250

Total	183, 450
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PUMPING ENGINES AND ROTARY PUMPS.

Wrought iron	1, 350
Cast iron	11, 150
Brass	1, 650

Total	14, 150
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DONKEY PUMPS AND APPURTENANCES.

Wrought iron	1, 000
Cast iron	3, 050
Brass	450

Total	4, 500
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MISCELLANEOUS.

Wrought-iron coal bunkers.....	20, 000
Wrought-iron oil tanks.....	5, 000
Cast-iron floor plates.....	34, 220
Stairs and ladders:	
Wrought iron.....	600
Cast iron	1, 200
Distilling apparatus:	
Cast iron	350
Brass	630
Spare pieces:	
Wrought iron.....	8, 200
Brass	4, 100

Total	74, 300
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TOTAL WEIGHT OF MACHINERY.

The total weight of the machinery was 2,207,200 pounds, or 985.357 tons: the metallic portion of which weighed 1,891,600 pounds, or 844.464 tons, distributed as follows:

	Pounds.
Wrought iron.....	1, 004, 450
Cast iron	569, 370
Steel	1, 450
Brass	257, 930
Copper	38, 550
Lead	19, 850

Total	1, 891, 600
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EXPERIMENTS MADE TO DETERMINE THE NUMBER OF HORSES-POWER REQUIRED TO OPERATE THE CIRCULATING PUMPS AT DIFFERENT SPEEDS.

The two steam cylinders which operated the two circulating pumps were vertical simple engines, using their steam without expansion and exhausting it into the condensers. These pumps, together with their steam cylinders, were upon the same horizontal shaft, and supplied the

condensers with refrigerating or condensing water for the steam worked off by the motive engine. Of course the power developed by these pumping engines was additional to the power developed by the motive engine, and was consequently not measured by the indicator diagrams taken from the three cylinders of the latter. There was no difficulty, however, in taking indicator diagrams from the engines driving the circulating pumps, and the horses-power computed from them could be added to those developed by the motive engine. But the cost in fuel of the horse-power developed by the pumping engines could not be ascertained. It was certainly very much greater than the similar cost of the horse-power developed by the motive engine, for the reasons that the cylinders of the pumping engines were not compounded, were not steam jacketed, and did not use the steam expansively; further, the indicated pressure in these cylinders was very small comparably with that in the cylinders of the motive engine, so that the proportion of the total power in the case of the pumping engines utilized as indicated power and as net power was very small comparably with the corresponding powers of the motive engine. The number of reciprocations, however, in equal time, made by the pistons of the pumping engines was very much greater than in the case of the motive engine, and to the extent of the influence of the difference the cost of the power with the pumping engines would be lessened. Judging from the experiments on other simple engines of about the dimensions and conditions of the pumping engines, it is probable that the indicated horses-power in the case of the latter cost about $7\frac{1}{2}$ pounds of coal per hour, or about three times as much as the indicated horses-power developed by the motive engine. In determining, therefore, the cost in fuel of the power developed by the motive engine alone, a number of pounds of coal equal to the product of the indicated horses-power developed by the pumping engines into $7\frac{1}{2}$ should be deducted from the weight of coal consumed per hour, and the power divided into the remainder. But if the economic performance of the engines as a whole—that is, combined performance of the motive and pumping engines—be required, then the power developed by the latter should be added to the power developed by the former, and the aggregate divided into the weight of fuel consumed per hour.

The cylinders of the pumping engines had the following dimensions:

Number of cylinders.....	2	
Diameter of cylinders.....	$11\frac{1}{2}$	inches.
Stroke of piston	9	inches.
Diameter of piston-rods (one to each cylinder).....	2	inches.
Aggregate net area of both pistons.....	204.5966	square inches.
Space displacement of both pistons per stroke.....	1.0656	cubic feet.

On the 8th of September, 1883, an experiment was made by the undersigned with the above pumping engines to ascertain the indicated pressure and power required to make different numbers of revolutions per minute of the shaft. The vessel was secured alongside the wharf of the New York navy-yard.

Three sets of indicator diagrams were taken from each end of the cylinder at each speed of shaft, and these speeds varied from 90 to 360 revolutions per minute, increasing by about 20 revolutions per minute at a time. The mean indicated pressure from the three sets of diagrams was taken as the indicated pressure for the corresponding speed of shaft.

The indicated pressures for each speed were laid off by scale of equal parts as ordinates at right angles to a straight base whose abscissæ represented by scale the corresponding speeds, and a graphic curve was passed among the free ends of the ordinates, leaving about as many

on one side of the curve as on the other. Then, on new ordinates erected at new abscissæ, representing speeds from 90 to 360 revolutions of the shaft per minute, increasing by 10 revolutions per minute at a time, there were measured by scale between the base and curve the indicated pressures in pounds per square inch of pistons due to each of these speeds, and the results are given in the following table.

The pressure required to work the pumping engines, *per se*, or unloaded, is estimated at 0.625 pound per square inch of pistons, and is constant at all speeds. The subtraction of this quantity from the indicated pressures gives the net pressures applied to the crank-pins of these engines, and from these net pressures there must again be subtracted $7\frac{1}{2}$ per centum of them for the friction of the load, the remainder being the pressure in pounds per square inch of pistons applied to circulating the water from the fans of the rotary pump to the delivery overboard through the condensers and connecting pipes.

As the pumping engines, condensers, and delivery overboard were all beneath the outboard water-level, there was no lifting of the water, or pumping, properly so called, but only its circulation, involving the overcoming of its inertia, of its resistance to change of direction in the pipes, and of the resistance of the wetted surfaces over which it passed.

The rotary fans do not deliver the same quantity of water to the condensers per revolution at high speeds of shaft as at low speeds. There is a continual lessening of the quantity of water per revolution as the number of revolutions per minute increase, so that the problem of ratio of power to quantity of water delivered in equal times with different speeds of shaft becomes a very complicated one, solvable only by experiment.

From the indicated pressures in the following table there will be perceived that the cylinders of the pumping engines were greatly too large, even when worked at their highest speed. Their capacity was, in fact, about six times what was necessary at the maximum under their actual conditions of use, involving a considerable loss in economy of fuel. These cylinders should have been compounded, the steam worked with an expansion of four or five times, and a fly-wheel attached to the shaft to enable these measures of expansion to be used. By this change the cost in fuel of the power they develop could have been reduced one-half.

Important practical advantages attend the employment on board of deep-draught sea-going steamers of small, independent engines, working rotary fans for supplying the condenser with refrigerating or condensing water, instead of the employment of a reciprocating pump worked by the motive engine. In this case the water is not to be lifted, but only circulated. There would, of course, be a natural current through the condenser due to the difference of the specific gravity of water when entering and when leaving it, caused by difference of temperature, and the rotary fan has only to accelerate without interrupting this movement, which is thus accomplished with less expenditure of power than is required with a regular pump. The rotary fan has no valves, and the power required to work the valves of a regular pump is also saved, and as the water on the suction side of the pump does not always follow up the pump piston solidly, so as to maintain the atmospheric and water pressure upon it, there is a corresponding loss in pumping from a minus pressure; also, as the pump in this case breaks the connection between the water entering the condenser and leaving it, the value of the natural current due to the difference in the specific gravity of the cold entering and the hot leaving water is lost.

The greater the required number of reciprocations to be made in a given time by the piston of a regular pump, the greater are the objections to its use for supplying condensers with refrigerating water; and when the circulating pump is large, as it has to be in the case of high powers developed by the motive engine, and when it is worked directly by that engine, the number of strokes that can be properly made per minute by its piston limits the number of strokes to be made in the same time by the steam pistons. By relieving the motive engine of this pump, the steam pistons can be worked at higher reciprocating speeds, and the capacity of the steam cylinders proportionately reduced, with all which that implies.

The objections to independent circulating engines are that they add to the mechanism and require more attention than a pump worked by the motive engine. They occupy also additional space, and much more than that which contains them, for a passage way must be provided all around them.

The employment of independent circulating engines enables the annoyance and inconvenience of blowing off steam into the air to be avoided when the motive engine is unexpectedly stopped for a short time. In that event, the steam from the boiler, instead of being blown into the air with a deafening noise which makes the hearing of orders on deck impossible, is blown into the condenser through "bleeding pipes," the independent circulating engines being continued in action and the resulting water of condensation drawn from the condenser and sent back to the boiler by the auxiliary steam-pump.

Results of the experiments made during the 8th of September, 1883, on the independent circulating engines of the Trenton, worked at different speeds of shaft.

Number of double strokes made per minute by the pistons of the engines.	Indicated pressures upon the pistons in pounds per square inch.	Indicated horses-power developed by the circulating engines.	Net pressures upon the pistons in pounds per square inch.	Net horses-power developed by the circulating engines.	Applied to the movement of the water.	
					Pressures upon the pistons in pounds per square inch.	Horses-power developed by the circulating engines.
90	1.985	1.66144	1.360	1.13832	1.25800	1.05295
100	2.115	1.96695	1.490	1.38570	1.37825	1.28177
110	2.335	2.38870	1.710	1.74933	1.58175	1.61813
120	2.525	2.81790	1.900	2.12040	1.75750	1.96137
130	2.710	3.27639	2.085	2.52076	1.92862	2.33171
140	2.915	3.79533	2.290	2.98158	2.11825	2.75796
150	3.085	4.30357	2.480	3.43170	2.27550	3.17432
160	3.335	4.96248	2.710	4.03248	2.50675	3.73004
170	3.560	5.62836	2.935	4.64023	2.71487	4.29222
180	3.800	6.36120	3.175	5.31485	2.93687	4.91624
190	4.035	7.12984	3.410	6.02547	3.15425	5.57356
200	4.300	7.99800	3.675	6.83550	3.39937	6.32284
210	4.560	8.90568	3.935	7.68505	3.63987	7.10868
220	4.835	9.89241	4.210	8.61366	3.89425	7.96764
230	5.120	10.95168	4.495	9.61480	4.15787	8.89369
240	5.405	12.06396	4.780	10.66896	4.42150	9.86879
250	5.700	13.25250	5.075	11.79937	4.69437	10.91442
260	5.950	14.38710	5.325	12.87585	4.92562	11.91016
270	6.190	15.54309	5.565	13.97311	5.14762	12.92513
280	6.415	16.70466	5.790	15.07716	5.35575	13.94637
290	6.610	17.82717	5.985	16.14154	5.53612	14.93093
300	6.785	18.93015	6.160	17.18660	5.69800	15.89760
310	6.975	20.10892	6.350	18.30705	5.87375	16.93402
320	7.050	20.98080	6.425	19.12080	5.94312	17.68674
330	7.140	21.91366	6.515	19.99453	6.02637	18.49494
340	7.225	22.84545	6.600	20.86920	6.10500	19.30401
350	7.285	23.71267	6.660	21.67830	6.16050	20.05243
360	7.335	24.55758	6.710	22.46508	6.20675	20.78020

TABLE No. 1.

In the immediately following table, No. 1, will be found in complete detail the data and results of a six hours' trial made on the 15th of October, 1878, in the Mediterranean, to ascertain the maximum performance of the Trenton with average Welsh semi-bituminous coal. In making this trial no steam jet was used in the chimney, nor any other means employed to force the chimney draught beyond what was due to the temperature of the escaping gases of combustion. Only the regular engineer's watch of firemen and coal-heavers were on duty in the fire-room, and as, of course, there could be no inducements offered to make them exert themselves beyond their ordinary efforts, the power developed and the speed accomplished were what could be steadily maintained as long as the fuel lasted. The speed, in fact, was the maximum under the conditions of ordinary practice.

The indicator diagrams were taken at the end of every half hour from each end of each cylinder, so that there were twelve sets of diagrams taken in all. Simultaneously with them the other data of the experiment were noted in a tabular log. The water was smooth and the air nearly calm.

The vessel was at 13 inches less draught of water than the deep load draught, presenting 52 square feet less immersed transverse section, 296.9772 tons less displacement, and 572 square feet less external wetted surface of hull than at the deep-load draught of water.

The different quantities in the table have been grouped for facility of reference, and they are so fully described on their respective lines that no further explanation is needed.

Although the rate of combustion (11.3821 pounds of coal per square foot of grate surface per hour) was less than half of what is obtained with similar coal during the trial trips of the steamers of the British navy, yet the boiler pressure (nearly 70 pounds per square inch above the atmosphere, with wide throttle-valve) was as great as could safely be carried, while the steam was expanded only five times. Evidently the engine could not work off any more steam, had the boilers been able to furnish it. The capacity of the cylinders and the pitch of the screw were adapted to the grate surface of the boilers for anthracite as fuel, but by lessening that pitch, and thus allowing the pistons of the engine to make proportionally more double strokes per minute, a great deal more steam could be worked off if the journals of the engine could be kept cool at the increased velocity.

The abnormally slow combustion of semi-bituminous coal in the boilers of the Trenton was due to their very small calorimeter over the bridge walls, to the obstruction of the steam-pipes in the uptakes, and, more than all, to the entirely too little area of hatch over the fire-room. Even this area, small as it was, was much diminished in effect by the boats and other objects placed over it on deck, thus greatly restricting the air supply to the furnaces. Neither could the firemen, much too few for forcing the fires to the utmost, be compelled to any extra effort, as in the case of the British navy trials, where a large additional force of trained firemen are temporarily embarked for the special occasion, and stimulated by a bounty paid by the contractors for the machinery, or as in the case of merchant steamers, where the fear of discharge from a desirable position produces the same effect.

The aggregate total horses-power developed by the engine, given in the table, are the sum of the aggregate indicated horses-power, and of the horses-power expended in overcoming the back pressure against

the pistons, calculated down to the zero of pressure, and for the portion of the return stroke of the pistons which elapses before the cushioning begins. Consequently the total horses-power referred to are exclusive of overcoming the cushioning.

The indicated and the net horses-power developed in each cylinder are calculated in the usual way for the entire area of the piston of each cylinder. The total horses-power developed in the small cylinder is calculated for the entire area of its piston, for the fraction of the stroke of the piston before the cushioning began, and for the pressure down to zero; but in the case of the two large cylinders it is calculated for only the surface of the piston of each which remains of the area of the pistons of those cylinders after deducting from each of them half the area of the piston of the small cylinder, the pressure is, of course, down to zero, and for the fraction of the stroke of the piston before the cushioning begins.

The thermal equivalent of the total horses-power developed in the engine by the expanded steam, after the closing of the cut-off valve on the small cylinder, is calculated for the value of one Fahrenheit unit of heat for every 789 $\frac{1}{4}$ foot-pounds of work done during the expansion.

The economic vaporization by the boiler, namely, 11 pounds of water under the experimental conditions per pound of the combustible portion of the coal, that is, of the portion which remains after deducting the refuse of ash, clinker, &c., from the crude coal, is a result given by many experiments on precisely the same kind of boiler, in type and proportions. It is introduced for the purpose of allowing a close approximation to be made of the condensation of steam in the cylinders due to all other causes than the production of the power by the expanded steam after the closing of the cut-off valve on the small cylinder.

In the Table No. 1, the pounds of fuel consumed per hour per horse-power developed by the engine is obtained by dividing the pounds of fuel consumed per hour by the horses-power developed by the motive engine *alone*. This is in accordance with the usual practice, which ignores the work of independent pumping-engines because not measured, and makes the economic result comparable with that of other motive engines having separate pumping-engines. In the present case, however, the experiments hereinbefore given with the independent pumping-engines of the Trenton allows the power developed by them to be known. The difference in the economic result caused by including the latter quantity is not material, but is to the advantage of the engine, and should be credited to it.

The circulating rotary pumps for supplying the condensers with condensing water or refrigerating water made 350 revolutions per minute, and the engines driving them developed 23.7127 indicated horses-power, and 21.6783 net horses-power, while 20.0524 horses-power were applied to the movement of the water, exclusive of the frictions of the engines, *per se*, and of the load. The motive engine developed 2,414.3079 indicated horses-power and 2,176.6844 net horses-power, adding to which the above indicated and net horses-powers developed by the independent pumping-engines, there results 2,438.0206 indicated horses-power and 2,198.3627 net horses-power produced by the consumption of 5,600 pounds of coal per hour and of 4,900 pounds per hour of the combustible portion of that coal, which are equivalent to the following :

Pounds of coal consumed per hour per indicated horse-power	2. 2969
Pounds of coal consumed per hour per net horse-power	2. 5474
Pounds of combustible consumed per hour per indicated horse-power	2. 0099
Pounds of combustible consumed per hour per net horse-power	2. 2290

The above determination of the cost of the power in weight of fuel consumed per hour gives that cost for the power developed by the motive engine *alone* too large, because the power (combined with it) developed by the pumping engines cost at least three times as much fuel per horse-power. Assuming, then, that the indicated horse-power developed by the pumping-engines cost $7\frac{1}{2}$ pounds of coal per hour, the weight of coal consumed per hour to supply them with steam would be $(23.7127 \times 7.5 =) 177.8452$ pounds, deducting which from the 5,600 pounds consumed per hour in the furnaces, leaves 5,422.1548 pounds of crude coal and 4,744.3854 pounds of combustible consumed per hour to produce the 2,414.3079 indicated horses-power, the 2,176.6844 net horses-power, and the 3,262.0322 total horses power developed by the motive engine alone, which are equivalent to the following economic results for that engine alone:

Pounds of coal consumed per hour per indicated horse-power	2. 2458
Pounds of coal consumed per hour per net horse-power.....	2. 4910
Pounds of coal consumed per hour per total horse-power.....	1. 6622
Pounds of combustible consumed per hour per indicated horse-power.....	1. 9651
Pounds of combustible consumed per hour per net horse-power.....	2. 1796
Pounds of combustible consumed per hour per total horse-power	1. 4544

The temperature of the injection water being 74 degrees Fahrenheit, and that of the discharge water 120 degrees, there were taken out of each pound of injection water delivered into the condenser, say, 46 Fahrenheit units of heat. Now, there went from the large cylinders into the condenser 53,900 pounds of steam per hour at the average pressure of, say, $10\frac{1}{4}$ pounds per square inch above zero, carrying with them, say, 1,173 Fahrenheit units of heat per pound weight of steam; and as the temperature of the feed water was 137 degrees Fahrenheit, there remained 1,036 Fahrenheit units of heat to be taken out of each pound weight of steam by the injection water, which required $\left(\frac{1036}{46} \times 53900 =\right) 1,213,922$ pounds of injection water per hour, or 20,232 pounds per minute. As the pumps made 350 revolutions per minute, they delivered per revolution a little less than 58 pounds of water.

TABLE No. 1.—*Containing the data and results of the trial of the United States steamship Trenton, under steam alone, in the Mediterranean, off Ville Franche, on the 15th October, 1878, using all the steam that could be obtained by the regular watch of firemen and coal-heavers, burning average (Cardiff) Welsh semi-bituminous coal, with natural draught, in all the eight boilers of the vessel.*

[This trial was made for the purpose of ascertaining the maximum performance of the vessel that could be sustained during six consecutive hours, with all the boilers fired to the utmost under the conditions of ordinary practice, with average free-burning steam coal. The water was smooth, and the atmosphere nearly calm.]

VESSEL.

Vessel's draught of water during the trial, in feet and inches:

Forward	18' 6"
Mean	19' 7"
Aft	20' 8"
Vessel's area of greatest immersed transverse section, in square feet.	683
Vessel's displacement, in tons.....	3,517.4228

Area of external immersed or wetted surface of hull, in square feet.. 16,060.13

TOTAL QUANTITIES.

Duration of the trial in consecutive hours.....	6
Total number of double strokes made by the pistons of the engine ..	19,357
Total number of pounds of coal consumed	33,600
Total number of pounds of refuse from the coal, in ash, clinker, &c.	4,200

Total number of pounds of combustible or gasifiable portion of the coal consumed	29,400
Per centum of the coal in refuse of ash, clinker, &c.....	12.5
Total number of geographical miles of 6,086 feet steamed.....	75.672

ENGINE.

Steam pressure in the boilers, in pounds per square inch above the atmosphere	69.82
Steam pressure in the receiver, in pounds per square inch above the atmosphere	7.20
Proportion of the throttle-valve open.....	Wide open.
Fraction completed of the stroke of the piston of the small cylinder when the steam was cut off	0.6750
Fraction completed of the return stroke of the piston of the small cylinder when the steam was cushioned.....	0.8500
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cut off	0.5675
Fraction completed of the return stroke of the pistons of the large cylinders when the steam was cushioned	0.8000
Number of times the steam was expanded.....	4.9924
Barometer in engine-room, in inches of mercury.....	29.993
Vacuum in the condensers, in inches of mercury	20.073
Pressure in the condensers, in pounds per square inch above zero...	4.87
Number of revolutions made per minute by the circulating pumps..	350
Number of double strokes made per minute by the pistons of the engine	53.76944+

SPEED.

Speed of the vessel per hour in geographical miles of 6,086 feet.....	12.612
Slip of the screw in per centum of its speed, calculated for a pitch of 26.5 feet.....	10.219

TEMPERATURES.

Temperature, in degrees Fahrenheit, of the atmosphere	74
Temperature, in degrees Fahrenheit, of the engine-room.....	96
Temperature, in degrees Fahrenheit, of the fire-room	157
Temperature, in degrees Fahrenheit, of the injection water	74
Temperature, in degrees Fahrenheit, of the discharge water	120
Temperature, in degrees Fahrenheit, of the feed water	137

RATE OF COMBUSTION.

Pounds of coal consumed per hour.....	5,600
Pounds of combustible consumed per hour.....	4,900
Pounds of coal consumed per hour per square foot of grate surface...	11.3821
Pounds of combustible consumed per hour per square foot of grate surface	9.9594
Pounds of coal consumed per hour per square foot of heating surface.	0.4708
Pounds of combustible consumed per hour per square foot of heating surface	0.4119

STEAM PRESSURES IN THE SMALL CYLINDER, PER INDICATOR.

Pressure on the piston of the small cylinder at commencement of its stroke, in pounds per square inch above zero.....	78.00
Pressure on the piston of the small cylinder at point of cutting off the steam, in pounds per square inch above zero	54.00
Pressure on the piston of the small cylinder at the end of its stroke, in pounds per square inch above zero	37.50
Mean back pressure against the piston of the small cylinder, including cushioning, in pounds per square inch above zero.....	23.80
Mean back pressure against the piston of the small cylinder during the portion of its stroke before the cushioning began, in pounds per square inch above zero	23.50
Back pressure against the piston of the small cylinder at the point where the cushioning began, in pounds per square inch above zero.	22.80

Indicated pressure on the piston of the small cylinder, in pounds per square inch.....	35.70
Net pressure on the piston of the small cylinder, in pounds per square inch.....	34.20
Total pressure on the piston of the small cylinder, exclusive of cushioning, reduced in the ratio of the stroke of the piston to the fraction of its stroke completed when the cushioning began, in pounds per square inch above zero.....	55.675
Mean total pressure on the piston of the small cylinder developed by the expanded steam alone after the closing of the cut-off valve, in pounds per square inch above zero.....	39.80

STEAM PRESSURES IN THE TWO LARGE CYLINDERS, PER INDICATOR.

Pressure on the pistons of the large cylinders at commencement of their stroke, in pounds per square inch above zero.....	22.25
Pressure on the pistons of the large cylinders at point of cutting off the steam, in pounds per square inch above zero.....	17.50
Pressure on the pistons of the large cylinders at the end of their stroke, in pounds per square inch above zero.....	10.60
Mean back pressure against the pistons of the large cylinders, including cushioning, in pounds per square inch above zero.....	7.60
Mean back pressure against the pistons of the large cylinders during the portion of their stroke before the cushioning began, in pounds per square inch above zero.....	6.80
Back pressure against the pistons of the large cylinders at the point where the cushioning began, in pounds per square inch above zero.....	6.60
Indicated pressure on the pistons of the large cylinders, in pounds per square inch.....	9.50
Net pressure on the pistons of the large cylinders, in pounds per square inch.....	8.00
Total pressure on the pistons of the large cylinders, exclusive of cushioning, reduced in the ratio of the stroke of the pistons to the fraction of their stroke completed when the cushioning began, in pounds per square inch above zero.....	14.94

HORSES-POWER.

Indicated horses-power developed by the small cylinder.....	1,239.0888
Net horses-power developed by the small cylinder.....	1,187.0262
Total horses-power developed by the small cylinder.....	1,932.3885
Total horses-power developed by the expanded steam alone in the small cylinder.....	448.9528
Indicated horses-power developed by the two large cylinders.....	1,175.2191
Net horses-power developed by the two large cylinders.....	989.6582
Total horses-power developed by the two large cylinders.....	1,329.6437
Total horses-power developed by the expanded steam alone in the two large cylinders.....	1,521.8813
Indicated horses-power developed by the engine.....	2,414.3079
Net horses-power developed by the engine.....	2,176.6844
Total horses-power developed by the engine.....	3,262.0322
Total horses-power developed by the expanded steam alone in the engine.....	1,970.8341

ECONOMIC RESULTS.

Pounds of coal consumed per hour per indicated horse-power.....	2.3195
Pounds of coal consumed per hour per net horse-power.....	2.5727
Pounds of coal consumed per hour per total horse-power.....	1.7167
Pounds of combustible consumed per hour per indicated horse-power.....	2.0296
Pounds of combustible consumed per hour per net horse-power.....	2.2511
Pounds of combustible consumed per hour per total horse-power.....	1.5021

WEIGHT OF STEAM ACCOUNTED FOR BY INDICATOR.

Pounds of steam present per hour in the small cylinder at the point of cutting off the steam, calculated from the pressure there.....	41,193.6600
Pounds of steam present per hour in the small cylinder at the end of the stroke of its piston, calculated from the pressure there.....	41,798.1918

Pounds of steam condensed per hour in the small cylinder to furnish the heat transmuted into the total horses-power developed in that cylinder by the expanded steam alone.....	1,215.4630
Sum of the two immediately preceding quantities.....	43,013.6548
Pounds of steam present per hour in the two large cylinders at the end of the stroke of their pistons, calculated from the pressure there	42,247.8353
Pounds of steam condensed per hour in the small cylinder and in the two large cylinders to furnish the heat transmuted into the total horses-power developed in those three cylinders by the expanded steam alone	5,191.3666
Sum of the two immediately preceding quantities.....	47,439.2019

PER CENTUM OF TOTAL PRESSURE ON PISTONS UTILIZED AS INDICATED AND AS NET PRESSURES.

Mean indicated pressure on the pistons of the two large cylinders, equivalent to the sum of the indicated pressure on those pistons and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder	19.5163
Mean net pressure on the pistons of the two large cylinders, equivalent to the sum of the net pressure on those pistons and of the net pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder.....	17.5954
Mean total pressure which applied to the combined areas of the pistons of the two large cylinders would produce the total horses-power developed by the engine	26.3690
Per centum of the mean total pressure utilized as indicated pressure.	74.0123
Per centum of the mean total pressure utilized as net pressure	66.7276

DIFFERENCE BETWEEN THE WEIGHT OF WATER VAPORIZED IN THE BOILERS AND THE WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR IN THE CYLINDERS.

Pounds of water vaporized per hour in the boilers, on the supposition that each pound of combustible vaporized 11 pounds of water under the experimental pressure and from the experimental temperature.	53,900.
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the point of cutting off the steam	23.574
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the end of the stroke of its piston.....	20.197
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the two large cylinders at the end of the stroke of their pistons.....	11.987

DISTRIBUTION OF THE POWER DURING THE EXPERIMENT OF OCTOBER 15, 1878.

The following distribution of the average indicated power developed by the engine during the above performance is made on the suppositions: 1st. That the power required to work the engine *per se*, or unloaded, is what was due to a pressure of $1\frac{1}{2}$ pounds per square inch of the pistons. 2d. The subtraction of the power, thus calculated, from the indicated power, leaves the net power, of which $7\frac{1}{2}$ per centum is taken for the power absorbed by the friction of the load. 3d. The power expended in overcoming the resistance of the water to the surface of the screw-blades is calculated on the data that each square foot of this surface, moving in its helical path with a velocity of 10 feet per second, experiences a resistance of 0.45 pound, which resistance for other speeds varies as the square of the speed. 4th. Deducting the sum of the powers absorbed by the friction of the load and expended

in overcoming the resistance of the water to the surface of the screw blades, from the net power, leaves a remainder which is expended in the slip of the screw and in the propulsion of the hull. Dividing this remainder in the proportion of the speed of the slip and the speed of the vessel, there is obtained for each the power expended on it.

	Horses- power.	Per centum of the net horses- power.
Indicated power developed by the engine	2414. 3079	
Power expended in working the engine <i>per se</i>	237. 6235	
Net power applied to the crank-pins	2176. 6844	100. 00
Power absorbed by the friction of the load	163. 2513	7. 50
Power expended in overcoming the resistance of the water to the surface of the screw-blades	135. 1950	6. 21
Power expended in the slip of the screw	191. 9371	8. 82
Power expended in the propulsion of the vessel	1686. 3010	77. 47
Total	2176. 6844	100. 00

THRUST OF THE SCREW DURING THE ABOVE PERFORMANCE.

The thrust of the screw as it would have been had it been measured by a dynamometer applied to the screw shaft during the performance of October 15, 1878, calculated from the data of that performance and the power required to propel the hull, as given in the preceding "distribution of the power," is as follows:

The horses-power expended in the propulsion of the vessel according to the distribution of the power, being 1686.3010, is equal to $(1686.3010 \times 33000 =)$ 55647933 foot pounds of work per minute; and the speed of the vessel being 12.612 geographical miles per hour, is equal to

$$\left(\frac{12.612 \times 6086}{60} = \right) 1275.943866 + \text{feet per minute;}$$

the resistance of the vessel at that speed, or its equivalent, the thrust of the screw, is $\left(\frac{55647933}{1275.943866 +} = \right)$ 43613.1514 pounds.

DETERMINATION OF THE POWER EXPENDED IN OVERCOMING THE RESISTANCE OF THE WATER TO THE IMMERSSED EXTERNAL OR WETTED SURFACE OF THE HULL.

Taking the resistance of the water to one square foot of rolled copper, moving in it with the velocity of 10 feet per second, to be 0.45 pound, and at other velocities to be this quantity modified in the ratio of their squares to the square of 10, and deducing from the speed of the vessel the mean speed of its immersed surface due to the inclination of its horizontal water lines to its longitudinal central plane, there results for that mean speed 20.88 feet per second, and, consequently, a surface resistance of $(10^2 : 0.45 :: 20.88^2 :)$ 1.9618848 pounds per square foot moving with that velocity.

As the immersed external or wetted surface of the vessel during the above performance was 16060.13 square feet, the power expended in overcoming the resistance of the water to it was

$$\left(\frac{16060.13 \times 1.9618848 \times 20.88 \times 60}{33000} = \right) 1196.1630 \text{ horses.}$$

The total power expended in propelling the hull being, according to the "distribution of the power," 1,686.3010 horses, and the power required

to overcome the resistance of the water to the wetted surface of the hull being 1196.1630 horses; there remain 490.1380 horses expended in the displacement of water. That is to say, the forebody of the vessel expended on the water in raising it vertically from the center of gravity of the greatest immersed transverse section of the hull to the water surface 490.1380 horses-power more than the afterbody recovered from the pressure beneath it of the vertically ascending column of water caused by the forward movement of the vessel. This fact proves that the hull was not properly modeled for the experimental speed of 12.6120 geographical miles per hour. It was much too short relatively to its draught of water and speed.

At the speed in question, of the entire power required for the propulsion of the vessel, $\left(\frac{1196.1630 \times 100}{1686.3010} = \right)$ 70.934 per centum were expended in overcoming the resistance of the water to the wetted surface, and $\left(\frac{490.1380 \times 100}{1686.3010} = \right)$ 29.066 per centum were expended in displacing water.

TABLE No. 2.

In the following table, No. 2, will be found, in complete detail, the data and results of a trial, twenty-four consecutive hours in duration, made in the Atlantic Ocean on the 22d and 23d of October, 1881, between the cities of Yorktown and New York.

The Trenton, on her return from her Mediterranean cruise, immediately proceeded to Yorktown, Va., to form part of the centennial celebration of the capture of the British army in that city by the allied American and French forces. After the completion of the celebration the vessel was ordered to the New York navy-yard, and directed to make during the passage a careful experiment with the view of ascertaining her speed, power developed, consumption of fuel, &c. The intention was to make the trial with anthracite alone, but this was found to be impracticable without much detention and labor, because there was remaining in the bunkers a considerable quantity of Welsh semi-bituminous coal, which would have had to be removed. As much anthracite, therefore, as was required to bring the vessel to her ordinary average draught of water when cruising was placed on board, and the trial, considered as a whole, was made with a mixture of the two coals in about equal proportion. During the first eight hours anthracite alone was used, during the second eight hours anthracite and Welsh coal were used in equal quantities, and during the last eight hours Welsh coal alone was used. The sea had a slight swell on, and there was a light breeze fifty degrees from ahead. No sail was set.

Just before commencing, two of the eight boilers were found to be disabled, so that the trial was made with the remaining six boilers, the ash-pit doors, furnace doors, and uptake doors of the disabled boilers being made as nearly air-tight as possible, in order that the force of the chimney draught might not be lessened by the inleakage of air. No steam jet was used in the chimney or other artificial means resorted to for increasing its draught beyond what was due to the temperature of the escaping gases. Only the regular engineer force of the vessel was employed, and the firemen and coal-heavers were in three watches.

The vessel's speed was accurately ascertained from the United States Coast Survey chart and the light-houses on shore, and varied to only an insignificant extent from the mean speed obtained from the patent log

and from the common chip log, the latter being thrown at half hourly intervals.

The indicator diagrams were taken at the end of every half hour from each end of each cylinder, so that there were forty-eight sets of diagrams taken in all. Simultaneously with them the other data of the experiment were noted in a tabular log. The quantities in Table No. 2 are the totals and means from all the diagrams and all the observations taken. These quantities have been grouped for facility of reference, and are so fully described on their respective lines that no further explanation is needed. All the calculations have been made in precisely the same manner as previously related for the similar ones in Table No. 1.

The vessel was at 14 inches less draught of water than the deep-load draught, presenting 56 square feet less immersed transverse section, 318.55 tons less displacement, and 616 square feet less external wetted surface of hull, than at the deep-load draught of water.

The slow combustion of anthracite relatively to Welsh semi-bituminous coal was very marked in this trial; for, although it composed but one-half of the fuel, the remaining half being Welsh coal, and the chimney draught being better than during the trial hereinbefore given in Table No. 2 with Welsh coal alone, for in that trial the air was calm, while in the trial given in Table No. 2 there was a light breeze fifty degrees from ahead, yet, the rate of combustion fell from 9.9594 pounds per hour of the combustible portion of the coal to 8.6247 pounds, a diminution of 13.4 per centum, showing that if only anthracite had been used, the rate of combustion would have fallen 26.8 per centum below that of the Welsh coal, and, allowing for the better conditions of chimney draught, not less than one-third. Had the trial been made with anthracite alone, the experimental speed of 11 geographical miles per hour would have fallen to about 10 miles.

The economic vaporization given for the boiler is, as previously related under the head of Table No. 1, that which has been obtained from many experiments on boilers of the same type and dimensions. It has been introduced in order to approximate the cylinder condensation other than that due to the development of power by the expanded steam alone.

In Table No. 2 the power given is that developed by the motive engine alone, and does not include the power developed by the auxiliary pumping engines supplying refrigerating water to the condensers; consequently, the economic results in Table No. 2 are too small, as previously explained under the head of Table No. 1, because they are obtained by dividing the power developed by the motive engine alone into the number of pounds of crude coal and of its combustible matter consumed in the furnaces per hour, thus excluding the power developed by the pumping engines, although including the fuel which supplied them with steam. This is in accordance with common usage, which does not include the power developed by auxiliary engines, doubtless because such power is not large enough to materially affect the result, and is inconvenient of measurement. In the present case, however, as the power developed by the pumping engines is known, it can be included in the calculation. And also by deducting from the coal and combustible consumed per hour the weight due to the development of the power of the pumping engines, which weight is greater, *pro rata* of power, for the pumping engines than for the motive engine, the true economic results for the latter will be known.

The circulating rotary pumps for supplying the condensers with con-

densing water or refrigerating water, made 220 revolutions per minute, and the engines driving them developed 9.8924 indicated horses-power, and 8.6137 net horses-power, while 7.9676 horses-power were applied to the movement of the water, exclusive of the frictions of the engines, *per se*, and of the load. The motive engine developed 1,494.7084 indicated horses-power, and 1,290.7267 net horses-power, adding to which the above indicated and net horses-powers developed by the independent pumping engines, there results 1,504.6008 indicated horses-power and 1,299.3404 net horses-power produced by the consumption of 3,744 pounds of coal per hour, and of 3,182.5 pounds per hour of the combustible portion of that coal, which are equivalent to the following :

Pounds of coal consumed per hour per indicated horse-power	2.4884
Pounds of coal consumed per hour per net horse-power	2.8815
Pounds of combustible consumed per hour per indicated horse-power	2.1152
Pounds of combustible consumed per hour per net horse-power	2.4493

The above determination of the cost of the power in weight of fuel consumed per hour gives that cost for the power developed by the motive engine *alone* too large, because the power (combined with it) developed by the pumping engines cost at least three times as much fuel per horse-power. Assuming, then, that the indicated horse-power developed by the pumping engines cost $7\frac{1}{2}$ pounds of coal per hour, the weight of coal consumed per hour to supply them with steam, would be $(9.8924 \times 7.5 =) 74.1931$ pounds, deducting which from the 3,744 pounds consumed per hour in the furnaces, leaves 3,669.8069 pounds of crude coal and 3,119.4349 pounds of combustible consumed per hour to produce the 1,494.7084 indicated horses-power, the 1,290.7267 net horses-power, and the 2,101.4054 total horses-power developed by the motive engine alone, which are equivalent to the following economic results for that engine alone:

Pounds of coal consumed per hour per indicated horse-power	2.4552
Pounds of coal consumed per hour per net horse-power	2.8432
Pounds of coal consumed per hour per total horse-power	1.7463
Pounds of combustible consumed per hour per indicated horse-power	2.0869
Pounds of combustible consumed per hour per net horse-power	2.4168
Pounds of combustible consumed per hour per total horse-power	1.4845

In the experiment with Welsh coal alone, Table No. 1, the total horse-power developed by the motive engine alone costs 1.4544 pounds of the combustible portion of that coal per hour, or 2 per centum less than the immediately above. As the heating power of equal weights of the combustible portion of anthracite and of semi-bituminous coal does not differ sensibly, and as the steam in both experiments was expanded the same number of times, the 2 per centum greater effect obtained from the fuel in the experiment of Table No. 1, over that obtained in the experiment of Table No. 2, was probably due to the greater piston speed in the former experiment. In the experiment of Table No. 1, the steam pistons made 53.76944 double strokes per minute; in the experiment of Table No. 2, they made 46.1570 double strokes per minute.

The temperature of the injection water being 65.9 degrees Fahrenheit, and that of the discharge water 107.6 degrees, there were taken out by each pound of injection water delivered into the condenser, say, 41.7 Fahrenheit units of heat. Now, there went from the large cylinders into the condenser 35,002 pounds of steam per hour, at the average pressure of, say, 8 pounds per square inch above zero, carrying with them, say, 1,169.7 Fahrenheit units of heat per pound weight of steam; and as the temperature of the feed-water was 126.2 degrees Fahrenheit, there remained

1,043.5 Fahrenheit units of heat to be taken out of each pound weight of steam by the injection water, which required $\left(\frac{1043.5}{41.7}\right) \times 35002 = 875,890$ pounds of injection water per hour, or 14,598 pounds per minute. As the pumps make 220 revolutions per minute, they delivered per revolution a little over $66\frac{1}{3}$ pounds of water. The faster these pumps are driven, the less water they deliver per revolution. For instance, when, during the full-power trial of the 15th of October, 1878, Table No. 1, they were driven at the speed of 350 revolutions per minute, their delivery of water was a little less than 58 pounds per revolution; their increased delivery, per revolution, therefore, due to a reduction of their speed to 220 revolutions per minute, was one-seventh.

TABLE No. 2.—*Containing the data and results of the trial of the United States steamship Trenton under steam alone at sea between the cities of Yorktown and New York, from 8 A. M. October 22 to 8 A. M. October 23, 1881, twenty-four consecutive hours, using all the steam that could be obtained by burning the coal at maximum rate with natural draught in six of the eight boilers of the vessel.*

[The coal for the first eight hours was anthracite, for the second eight hours a mixture of anthracite and Welsh steam coal, and for the last eight hours Welsh steam coal. The condition of the sea was a light swell, and the wind was a light breeze 50 degrees from ahead.]

VESSEL.

Vessel's draught of water during trial, in feet and inches:

Forward	18".6
Mean	19".6
Aft	20".6
Vessel's area of greatest immersed transverse section, in square feet.	679
Vessel's displacement, in tons.....	3,495.85
Area of external immersed or wetted surface of hull, in square feet.	16,016.13

TOTAL QUANTITIES.

Duration of the trial in consecutive hours	24
Total number of double strokes made by the pistons of the engine..	66,466
Total number of pounds of coal consumed	89,856
Total number of pounds of refuse from the coal, in ash, clinker, &c.	13,476
Total number of pounds of combustible or gasifiable portion of the coal consumed.....	76,380
Per centum of the coal in refuse of ash, clinker, &c.....	14.9973
Total number of geographical miles of 6,086 feet steamed, per chart.	264

ENGINE.

Steam pressure in the boilers, in pounds per square inch above the atmosphere	50.375
Steam pressure in the receiver, in pounds per square inch above the atmosphere	2.844
Proportion of the throttle-valve open.....	0.4075
Fraction completed of the stroke of the piston of the small cylinder when the steam was cut off.....	0.6465
Fraction completed of the return stroke of the piston of the small cylinder when the steam was cushioned.....	0.8200
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cut off.....	0.5157
Fraction completed of the return stroke of the pistons of the large cylinders when the steam was cushioned.....	0.7500
Number of times the steam was expanded.....	5.1882
Barometer in engine-room, in inches of mercury.....	30.364
Vacuum in the condensers, in inches of mercury.....	21.844
Pressure in the condensers, in pounds per square inch above zero ...	4.1825
Number of revolutions made per minute by the circulating pumps..	220.0000
Number of double strokes made per minute by the pistons of the engine	46.1570

SPEED.

Speed of the vessel per hour, in geographical miles of 6,086 feet....	11.0000
Slip of the screw in per centum of its speed, calculated for mean pitch of 26.5 feet.....	9.52

TEMPERATURES.

Temperature, in degrees Fahrenheit, of the atmosphere.....	63.6
Temperature, in degrees Fahrenheit, of the air in the engine-room ..	73.1
Temperature, in degrees Fahrenheit, of the air in the fire-room	141.2
Temperature, in degrees Fahrenheit, of the injection water	65.9
Temperature, in degrees Fahrenheit, of the discharge water	107.6
Temperature, in degrees Fahrenheit, of the feed water.....	126.2

RATE OF COMBUSTION.

Pounds of coal consumed per hour	3,744.0000
Pounds of combustible consumed per hour	3,182.5000
Pounds of coal consumed per hour per square foot of grate surface ..	10.1463
Pounds of combustible consumed per hour per square foot of grate surface	8.6247
Pounds of coal consumed per hour per square foot of heating surface.	0.3148
Pounds of combustible consumed per hour per square foot of heating surface	0.2675

STEAM PRESSURES IN THE SMALL CYLINDER, PER INDICATOR.

Pressure on the piston of the small cylinder at commencement of its stroke, in pounds per square inch above zero.....	61.4
Pressure on the piston of the small cylinder at point of cutting off the steam, in pounds per square inch above zero	44.0
Pressure on the piston of the small cylinder at the end of its stroke, in pounds per square inch above zero	30.4
Mean back pressure against the piston of the small cylinder, including cushioning, in pounds per square inch above zero.....	19.5
Mean back pressure against the piston of the small cylinder during the portion of its stroke before the cushioning began, in pounds per square inch above zero	18.5
Back pressure against the piston of the small cylinder at the point where the cushioning began, in pounds per square inch above zero.	18.1
Indicated pressure on the piston of the small cylinder, in pounds per square inch	27.0
Net pressure on the piston of the small cylinder, in pounds per square inch	25.5
Total pressure on the piston of the small cylinder, exclusive of cushioning, reduced in the ratio of the stroke of the piston to the fraction of its stroke completed when the cushioning began, in pounds per square inch above zero.....	42.17
Mean total pressure on the piston of the small cylinder developed by the expanded steam alone after the closing of the cut-off valve, in pounds per square inch above zero.....	31.5

STEAM PRESSURES IN THE TWO LARGE CYLINDERS, PER INDICATOR.

Pressure on the pistons of the large cylinders at commencement of their stroke, in pounds per square inch above zero	18.16
Pressure on the pistons of the large cylinders at point of cutting off the steam, in pounds per square inch above zero.....	14.02
Pressure on the pistons of the large cylinders at the end of their stroke, in pounds per square inch above zero.....	8.40
Mean back pressure against the pistons of the large cylinders, including cushioning, in pounds per square inch above zero.....	6.94
Mean back pressure against the pistons of the large cylinders, during the portion of their stroke before the cushioning began, in pounds per square inch above zero	6.08
Back pressure against the pistons of the large cylinders at the point where the cushioning began, in pounds per square inch above zero.	5.95

Indicated pressure on the pistons of the large cylinders, in pounds per square inch	6.50
Net pressure on the pistons of the large cylinders, in pounds per square inch	5.00
Total pressure on the pistons of the large cylinders, exclusive of cushioning, reduced in the ratio of the stroke of the pistons to the fraction of their stroke completed when the cushioning began, in pounds per square inch above zero	11.06

HORSES-POWER.

Indicated horses-power developed by the small cylinder	804.4517
Net horses-power developed by the small cylinder	759.7600
Total horses-power developed by the small cylinder	1,256.4344
Total horses-power developed by the expanded steam alone in the small cylinder	331.7693
Indicated horses-power developed by the two large cylinders	690.2567
Net horses-power developed by the two large cylinders	530.9667
Total horses-power developed by the two large cylinders	844.9710
Total horses-power developed by the expanded steam alone in the two large cylinders	1,026.8002
Indicated horses-power developed by the engine	1,494.7084
Net horses-power developed by the engine	1,290.7267
Total horses-power developed by the engine	2,101.4054
Total horses-power developed by the expanded steam alone in the engine	1,358.5695

ECONOMIC RESULTS.

Pounds of coal consumed per hour per indicated horse-power	2.5048
Pounds of coal consumed per hour per net horse-power	2.9007
Pounds of coal consumed per hour per total horse-power	1.7817
Pounds of combustible consumed per hour per indicated horse-power	2.1281
Pounds of combustible consumed per hour per net horse-power	2.4657
Pounds of combustible consumed per hour per total horse-power	1.5145

WEIGHT OF STEAM ACCOUNTED FOR BY INDICATOR.

Pounds of steam present per hour in the small cylinder at the point of cutting off the steam, calculated from the pressure there	27,433.1427
Pounds of steam present per hour in the small cylinder at the end of the stroke of its piston, calculated from the pressure there	28,886.6286
Pounds of steam condensed per hour in the small cylinder to furnish the heat transmuted into the total horses-power developed in that cylinder by the expanded steam alone	888.7402
Sum of the two immediately preceding quantities	29,775.3688
Pounds of steam present per hour in the two large cylinders at the end of the stroke of their pistons, calculated for the pressure there	27,167.5680
Pounds of steam condensed per hour in the small cylinder and in the two large cylinders to furnish the heat transmuted into the total horses-power developed in those three cylinders by the expanded steam alone	3,536.4561
Sum of the two immediately preceding quantities	30,704.0241

PER CENTUM OF TOTAL PRESSURE ON PISTONS UTILIZED AS INDICATED AND AS NET PRESSURES.

Mean indicated pressure on the pistons of the two large cylinders, equivalent to the sum of the indicated pressure on those pistons and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder	14.0753
Mean net pressure on the pistons of the two large cylinders, equivalent to the sum of the net pressure on those pistons and of the net pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder	12.1545
Mean total pressure which, applied to the combined areas of the pistons of the two large cylinders, would produce the total horses-power developed by the engine	19.7885
Per centum of the mean total pressure utilized as indicated pressure	71.13
Per centum of the mean total pressure utilized as net pressure	61.42

DIFFERENCE BETWEEN THE WEIGHT OF WATER VAPORIZED IN THE BOILERS AND THE WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR IN THE CYLINDERS.

Pounds of water vaporized per hour in the boilers, on the supposition that each pound of combustible vaporized 11 pounds of water under the experimental pressure and for the experimental temperature..	35,002.
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the point of cutting off the steam.....	21.624
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the end of the stroke of its piston.....	14.932
Difference in per centum of the weight of water vaporized in the boiler, between that weight and the weight of steam accounted for by the indicator in the two large cylinders at the end of the stroke of their pistons.....	12.279

DISTRIBUTION OF THE POWER DURING THE ABOVE TRIAL BETWEEN THE CITIES OF YORKTOWN AND NEW YORK.

Distributing the indicated horses-power developed by the engine during the above performance under steam alone, between the cities of Yorktown and New York, according to the method hereinbefore described, gives the following results:

	Horses-power.	Per centum of the net horses-power.
Indicated power developed by the engine	1,494.7084	.....
Power expended in working the engine, <i>per se</i>	203.9817	.....
Net power applied to the crank-pins	1,290.7267	100.00
Power absorbed by the friction of the load	96.8045	7.50
Power expended in overcoming the resistance of the water to the surface of the screw-blades.....	85.5202	6.63
Power expended in the slip of the screw.....	105.5199	8.17
Power expended in the propulsion of the vessel	1,002.8821	77.70
Total	1,290.7267	100.00

THRUST OF THE SCREW DURING THE ABOVE TRIAL BETWEEN THE CITIES OF YORKTOWN AND NEW YORK.

The thrust of the screw during the above performance under steam alone, between the cities of Yorktown and New York, calculated according to the method hereinbefore described, is $\left(\frac{11 \times 6086}{60} = 1115.7666\right;$
 $1002.8821 \times 33000 = 33095109.3$; and $\frac{33095109.3}{1115.7666} = 29661.3174$ pounds.

DETERMINATION OF THE POWER EXPENDED DURING THE ABOVE TRIAL BETWEEN THE CITIES OF YORKTOWN AND NEW YORK, IN OVERCOMING THE RESISTANCE OF THE WATER TO THE EXTERNAL IMMERSSED OR WETTED SURFACE OF THE HULL.

The horses-power expended during the above performance under steam alone, between the cities of Yorktown and New York, in overcoming the resistance of the water to the external immersed or wetted surface of the hull, calculated according to the method hereinbefore described, the mean speed of the immersed surface of the hull due to the inclina-

tion of its horizontal water lines to its longitudinal central plane, deduced from the speed of the vessel, being taken at 18.375 feet per second, is $\left(\frac{18.375^2 \times 0.45}{10^2} = 1.519383, \text{ and } \frac{1.519383 \times 16016.13 \times 1115.7666}{33000} = \right)$ 822.7811. Consequently, of the whole power 1002.8821 horses applied to the propulsion of the vessel, $\left(\frac{822.7811 \times 100}{1002.8821} = \right)$ 82.0417 per centum were absorbed by the resistance of the external immersed surface of the hull to the water, and the remaining 17.9583 per centum were expended in the displacement of water.

TABLE No. 3.

In the following table, No. 3, will be found in complete detail the mean performance of the Trenton while cruising at sea; that is to say, her mean performance under the conditions of ordinary practice as a naval cruiser. The quantities given embrace all those recorded in the steam-log for the entire time the engine was in operation from the vessel's first going into commission up to the date of this report. The steaming was done in the Atlantic Ocean and in the Mediterranean Sea. The fuel consumed was Welsh semi-bituminous coal, burned with natural draught. Of the eight boilers only five were used, comprising 307.5 square feet of grate surface and 7,434.375 square feet of water-heating surface.

As the vessel was sometimes under steam alone and sometimes under steam and sail combined, the sail being set whenever it could be made effective, the performance has correspondingly been divided into two parts, so as to show the results separately for the two cases in two different columns, while a third column gives the mean of all the steaming, both with and without sail. About one-sixth of the entire steaming was done with the assistance of sail; the remaining five-sixths was done without it.

The speed was taken by the chip-log hove hourly.

All the calculations in this table have been made in precisely the manner described for similar quantities in Table No. 1.

A complete set of indicator diagrams was taken during each day's steaming and pasted in the steam-log; these diagrams representing as nearly as practicable the mean conditions for the day on which they were taken, and on them were marked the proper accompanying data of steam pressure, position of throttle-valve, point of cutting off, vacuum in the condensers, number of double strokes made per minute by the steam pistons, etc., etc., existing at the time the diagrams were taken. The mean of all the data marked on the diagrams agreed with remarkable closeness with the mean of the corresponding quantities entered hourly in the steam-log, showing that the mean of the diagrams correctly represented the mean performance of the vessel.

The number of revolutions made by the rotary pumps supplying the condensers with refrigerating water was not recorded in the steam-log, but is known, from other sources, to have averaged about 150 per minute. The independent engines driving these pumps at this speed developed 4.3036 indicated horses-power, 3.4317 net horses-power, and applied to the movement of the water 3.1743 horses-power.

In Table No. 3, under the head of economic results, is given the cost of the power in pounds of fuel consumed per hour. These results are exclusive of the power developed by the pumping engines, as hereinbefore previously explained. Including this power, the indicated horses-power developed by the motive and pumping engines would be for

the mean of the whole performance in the last column of Table No. 3 ($909.3807 + 4.3036 =$) 913.6843, and the net horses-power would be ($745.2601 + 3.4317 =$) 748.6918, the fuel consumed being 2,884.9596 pounds per hour of Welsh semi-bituminous coal, of which 2,524.3396 pounds were combustible matter. According to these quantities the economic results would be as follows:

Pounds of coal consumed per hour per indicated horse-power.....	3.1575
Pounds of coal consumed per hour per net horse-power.....	3.8533
Pounds of combustible consumed per hour per indicated horse-power.....	2.7628
Pounds of combustible consumed per hour per net horse-power.....	3.3711

The cost in fuel of the power developed by the motive engine alone can be obtained by deducting from the entire fuel consumed in the furnaces per hour the portion which produced the power developed by the pumping engines, and dividing the remainder by the power developed by the motive engine alone. As the indicated horse-power developed by the motive engine cost, say, $3\frac{1}{7}$ pounds of coal per hour, and as the indicated horse-power developed by the pumping engines cost, say, three times as much, or $9\frac{3}{7}$ pounds of coal per hour, there would have been expended to produce the indicated horses-power developed by the pumping engine ($4.3036 \times 3\frac{3}{7} =$) 14.7552 pounds of coal per hour, which subtracted from the 2,884.9596 pounds consumed in the furnaces leaves 2,870.2044 pounds per hour of coal, and 2,511.4288 pounds per hour of combustible for the production by the motive engine of 909.3807 indicated horses-power, 745.2601 net horses-power, and 1,384.0401 total horses-power. The foregoing quantities would give the following economic results:

Pounds of coal consumed per hour per indicated horse-power.....	3.1562
Pounds of coal consumed per hour per net horse-power.....	3.8512
Pounds of coal consumed per hour per total horse-power.....	2.0738
Pounds of combustible consumed per hour per indicated horse-power.....	2.7617
Pounds of combustible consumed per hour per net horse-power.....	3.3698
Pounds of combustible consumed per hour per total horse-power.....	1.8146

By comparing the cost of the total horse-power developed by the motive engine alone in pounds of the combustible portion of Welsh semi-bituminous coal consumed per hour, as given under the head of Table No. 1, with the same cost as given above, there will be found in the latter case a great inferiority of economic result. For the experiment in Table No. 1 the cost of the total horse-power developed by the motive engine alone was 1.4544 pounds of combustible per hour. For the mean of the entire performance as given in Table No. 3, that cost was 1.8146 pounds, an inferiority of $\left(\frac{1.8146 - 1.4544 \times 100}{1.4544} = \right) 24.77$ per centum. To what can this large difference be attributed?

The total horse-power in both cases measures the whole of the work done by the steam, including all frictions and overcoming the back pressure against the pistons. The steam was used a little more expansively, and had the advantage of being throttled when the inferior result occurred; but it had the disadvantages of being used at a much lower pressure, and with a much less speed of piston, and to the latter cause principally is due the reduction of the 24.77 per centum in the economic development of the power. In the case of the experiment in Table No. 1, the pistons made 53.7694 double strokes per minute, while during the performance in Table No. 3 they made only 37.1372 double strokes per minute. The cylinder condensation in the latter case was nearly the double of what it was in the former case, as a natural result of the great difference in the speed of the pistons, notwithstanding the

less initial pressure and consequently lower temperature of the steam entering the cylinder with the slower piston speed, the back pressure remaining constant.

If, now, the comparison be made between the cost of the indicated horse-power developed by the motive engine alone, in pounds of combustible consumed per hour, in the two cases, the difference in the economic result will appear still greater. For the experiment in Table No. 1, the cost of that power was 2.2458 pounds of combustible per hour, while for the performance in Table No. 3 it was 3.1562 pounds, an inferiority of $\left(\frac{3.1562 - 2.2458 \times 100}{2.2458} = \right)$ 40.54 per centum.

The great excess of 40.54 over 24.77 per centum is due to the fact that, of the total pressure upon the pistons of the engine in the two cases, a less fraction was utilized as indicated pressure in the latter than in the former case, because the pressure required to work the engine, *per se*, was the same in both cases, and the back pressure—with equally good vacuum in the condenser—would also have been the same, while the total pressure was greatly less with the fewer strokes of piston made in equal time. The back pressure, during the experiment in Table No. 1, was 6.80 pounds per square inch above zero against the pistons of the large cylinders, with the temperature of the feed water 120 degrees Fahrenheit, while for the performance in Table No. 3 this back pressure was 5.85 pounds with a feed-water temperature of 111.2 degrees Fahrenheit. The difference of 8.8 degrees Fahrenheit in the temperature of the feed water in the two cases, combined with the less cylinder condensation when the back pressure is higher, other things equal, goes far, as regards economy of fuel, to compensate the difference of back pressure. For the experiment in Table No. 1, the indicated pressure was 74.01 per centum of the total pressure, while in Table No. 3 it was only 65.70 of that pressure.

The temperature of the feed water was 16 degrees Fahrenheit in excess of that of the discharge water. About one-half of this difference was due to the necessary difference of temperature on the heat-receiving and heat-delivering sides of the metal of the condenser tubes when the transfer of heat is made to a continuously renewed liquid in constant movement over it, and the remaining half was due to the increased temperature of the aqueous vapor and air drawn from the condenser and compressed by the air-pump to the much greater pressure in the air-tight reservoir or hot well, and equivalent to the work of compression. The vapor and air thus compressed, being forced by the pump through the feed water lying upon the delivery valves in the reservoir or hot well, imparted a portion of their increased temperature to it.

TABLE No. 3.—Containing the data and results of the performance at sea, under the conditions of ordinary practice, of the United States steamship Trenton, including all the steaming done between the 18th of October, 1877, and the 17th of September, 1881, both inclusive.

	Under steam alone.	Under steam and sail combined.	Totals and means of the two preceding columns.
VESEL.			
Vessel's draught of water, in feet and inches:			
Forward	18, 10	19, 0	18, 10½
Mean	19, 11	20, 0	19, 11¾
Aft	21, 0	21, 0	21, 0
Vessel's area of greatest immersed transverse section, in square feet	699.0	703.0	699.75
Vessel's displacement, in tons	3,608.8	3,631.64	3,613.08
Vessel's external immersed or wetted surface, in square feet	16,236.13	16,280.13	16,244.37
WIND AND SEA.			
Kind of wind	Gentle breeze	Moderate breeze	
Angle from ahead made by the wind with the vessel's keel	35	127	51
State of the sea	Gentle swell	Moderate swell	
TOTAL QUANTITIES.			
Aggregate number of hours steaming	2,086	442	2,528
Aggregate number of double strokes made by the pistons of the engine	4,622,802	1,010,167	5,632,969
Aggregate number of pounds of Welsh semi-bituminous coal consumed	6,049,965	1,243,213	7,293,178
Aggregate number of pounds of refuse from the coal in ash, clinker, soot, and dust	756,246	155,401	911,647
Aggregate number of pounds of combustible or gasifiable portion of the coal consumed	5,293,719	1,087,812	6,381,531
Per centum of the coal in refuse of ash, clinker, soot, and dust	12.5	12.5	12.5
Aggregate number of geographical miles of 6,086 feet steamed	17,598	4,518	22,116
ENGINE.			
Steam pressure in the boilers in pounds per square inch above the atmosphere	51.0	53.7	51.5
Proportion of the throttle-valve open	0.45	0.33	0.43
Fraction completed of the stroke of the piston of the small cylinder when the steam was cut off	0.60	0.60	0.60
Fraction completed of the stroke of the piston of the small cylinder when the steam was cushioned	0.85	0.85	0.85
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cut off	0.58	0.58	0.58
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cushioned	0.80	0.80	0.80
Number of times the steam was expanded	5.5427	5.5427	5.5427
Barometer, in engine-room, in inches of mercury	30.03	30.20	30.06
Vacuum in the condensers in inches of mercury	21.82	21.15	21.70
Pressure in the condensers in pounds per square inch above zero	4.0300	4.4423	4.1036
Number of double strokes made per minute by the pistons of the engine	36.9351	38.0908	37.1372
TEMPERATURES.			
Temperature, in degrees Fahrenheit, of the air on deck	67.6	65.0	67.1
Temperature, in degrees Fahrenheit, of the air in the engine-room	82.0	76.3	81.0
Temperature, in degrees Fahrenheit, of the injection water	67.3	66.2	67.1
Temperature, in degrees Fahrenheit, of the discharge-water	97.1	96.9	97.0
Temperature, in degrees Fahrenheit, of the feed-water	111.2	111.3	111.2

TABLE No. 3.—Containing the data and results of the performance at sea, under the conditions of ordinary practice, &c.—Continued.

	Under steam alone.	Under steam and sail combined.	Totals and means of the two preceding columns.
RATE OF COMBUSTION.			
Pounds of coal consumed per hour	2,900.2708	2,812.7000	2,884.9596
Pounds of combustible consumed per hour	2,537.7370	2,461.1125	2,524.3396
Pounds of coal consumed per hour per square foot of grate surface.....	9.4318	9.1470	9.3820
Pounds of combustible consumed per hour per square foot of grate surface.....	8.2528	8.0036	8.2092
Pounds of coal consumed per hour per square foot of heating surface.....	0.3901	0.3783	0.3881
Pounds of combustible consumed per hour per square foot of heating surface.....	0.3414	0.3310	0.3395
SPEED.			
Speed of the vessel per hour in geographical miles of 6,086 feet.....	8.4361	10.2217	8.7484
Slip of the screw in per centum of its speed, calculated for a pitch of 26.50 feet.....	12.5747	—2.6444	9.8317
STEAM PRESSURES IN THE SMALL CYLINDER PER INDICATOR.			
Pressure on the piston of the small cylinder at the commencement of its stroke, in pounds per square inch above zero ..	54.00	51.14	53.50
Pressure on the piston of the small cylinder at point of cutting off the steam, in pounds per square inch above zero.....	33.00	31.17	32.68
Pressure on the piston of the small cylinder at the end of its stroke, in pounds per square inch above zero.....	20.53	19.39	20.33
Mean back pressure against the piston of the small cylinder, including cushioning, in pounds per square inch above zero.....	16.13	14.00	15.75
Mean back pressure against the piston of the small cylinder, before the cushioning began, in pounds per square inch above zero.....	15.50	13.38	15.13
Back pressure against the piston of the small cylinder at the point where the cushioning began, in pounds per square inch above zero.....	15.10	13.00	14.76
Indicated pressure on the piston of the small cylinder, in pounds per square inch.....	20.10	18.96	19.90
Net pressure on the piston of the small cylinder, exclusive of cushioning, reduced in the ratio of the stroke of the piston to the fraction of its stroke completed when the cushioning began, in pounds per square inch above zero.....	18.60	17.46	18.40
Total pressure on the piston of the small cylinder, exclusive of cushioning, reduced in the ratio of the stroke of the piston to the fraction of its stroke completed when the cushioning began, in pounds per square inch above zero.....	33.28	30.33	32.76
Mean total pressure on the piston of the small cylinder developed by the expanded steam alone after the closing of the cut-off valve, in pounds per square inch above zero.....	.....	.....	25.68
STEAM PRESSURES IN THE LARGE CYLINDERS, PER INDICATOR.			
Pressure on the pistons of the large cylinders at commencement of their stroke, in pounds per square inch above zero ..	14.10	12.08	13.93
Pressure on the pistons of the large cylinders at point of cutting off the steam, in pounds per square inch above zero ..	12.90	11.87	12.72
Pressure on the pistons of the large cylinders at the end of their stroke, in pounds per square inch above zero ..	7.32	6.72	7.20
Mean back pressure against the pistons of the large cylinders, including cushioning, in pounds per square inch above zero.....	6.57	6.82	6.67
Mean back pressure against the pistons of the large cylinders before the cushioning began, in pounds per square inch above zero.....	5.75	6.00	5.85
Back pressure against the pistons of the large cylinders at the point where the cushioning began, in pounds per square inch above zero.....	5.55	5.80	5.64
Indicated pressure on the pistons of the large cylinders, in pounds per square inch.....	5.15	4.64	5.06
Net pressure on the pistons of the large cylinders, exclusive of cushioning, reduced in the ratio of the stroke of the pistons to the fraction of their stroke completed when the cushioning began, in pounds per square inch above zero...	3.65	3.14	3.56
Total pressure on the pistons of the large cylinders, exclusive of cushioning, reduced in the ratio of the stroke of the pistons to the fraction of their stroke completed when the cushioning began, in pounds per square inch above zero...	9.75	9.75	9.74

HORSES-POWER.

Indicated horses-power developed by the small cylinder.....	479. 2190	466. 1837	477. 0467
Net horses-power developed by the small cylinder.....	443. 4563	429. 3021	441. 0884
Total horses-power developed by the small cylinder.....	793. 4531	745. 7464	785. 3291
Total horses-power developed by the expanded steam alone in the small cylinder.....			246. 2736
Indicated horses-power developed by the two large cylinders.....	437. 6291	406. 6285	432. 3340
Net horses-power developed by the two large cylinders.....	310. 1643	275. 1753	304. 1717
Total horses-power developed by the two large cylinders.....	596. 0642	614. 7150	598. 7110
Total horses-power developed by the expanded steam alone in the two large cylinders.....			721. 0349
Indicated horses-power developed by the engine.....	916. 8481	872. 8122	909. 3807
Net horses-power developed by the engine.....	753. 6206	704. 4774	745. 2601
Total horses-power developed by the engine.....	1, 389. 5173	1, 360. 4614	1, 384. 0401
Total horses-power developed by the expanded steam alone in the engine.....			967. 3085

ECONOMIC RESULTS.

Pounds of coal consumed per hour per indicated horse-power.....	3. 1633	3. 2226	3. 1724
Pounds of coal consumed per hour per net horse-power.....	3. 8484	3. 9926	3. 8718
Pounds of coal consumed per hour per total horse-power.....	2. 0872	2. 0675	2. 0845
Pounds of combustible consumed per hour per indicated horse-power.....	2. 7679	2. 8197	2. 7759
Pounds of combustible consumed per hour per net horse-power.....	3. 3674	3. 4935	3. 3872
Pounds of combustible consumed per hour per total horse-power.....	1. 8263	1. 8090	1. 8239

WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR.

Pounds of steam present per hour in the small cylinder at the point of cutting off the steam, calculated from the pressure there.....			15, 476. 9931
Pounds of steam present per hour in the small cylinder at the end of the stroke of its piston, calculated from the pressure there.....			15, 603. 8669
Pounds of steam condensed per hour in the small cylinder to furnish the heat transmuted into the total horses-power developed in that cylinder by the expanded steam alone.....			653. 9698
Sum of the two immediately preceding quantities.....			16, 257. 8367
Pounds of steam present per hour in the two large cylinders at the end of the stroke of their pistons, calculated from the pressure there.....			19, 278. 5564
Pounds of steam condensed per hour in the small cylinder and in the two large cylinders to furnish the heat transmuted into the total horses-power developed in those three cylinders by the expanded steam alone.....			2, 511. 7556
Sum of the two immediately preceding quantities.....			21, 790. 3120

PER CENTUM OF TOTAL PRESSURE ON PISTONS UTILIZED AS INDICATED AND AS NET PRESSURES.

Mean indicated pressure on the pistons of the two large cylinders equivalent to the sum of the indicated pressure on those pistons and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder.....	10. 7894	9. 9596	10. 6433
Mean net pressure on the pistons of the two large cylinders equivalent to the sum of the net pressure on those pistons and of the net pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder.....	8. 8686	8. 0387	8. 7225
Mean total pressure, which applied to the combined areas of the pistons of the two large cylinders would produce the total power developed by the engine.....	16. 3518	15. 5241	16. 1987
Per centum of the mean total pressure utilized as indicated pressure.....	65. 98	64. 16	65. 70
Per centum of the mean total pressure utilized as net pressure.....	54. 24	51. 78	53. 85

TABLE No. 3.—Containing the data and results of the performance at sea, under the conditions of ordinary practice, &c.—Continued.

	Under steam alone.	Under steam and sail combined.	Totals and means of the two preceding columns.
DIFFERENCE BETWEEN THE WEIGHT OF WATER VAPORIZED IN THE BOILERS AND THE WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR.			
Pounds of water vaporized per hour in the boilers on the supposition that each pound of combustible vaporized 11 pounds of water under the experimental pressure and from the experimental temperature			27, 767. 7356
Difference in per centum of the weight of water vaporized in the boilers between that weight and the weight of steam accounted for by the indicator in the small cylinder at the point of cutting off the steam			44. 2627
Difference in per centum of the weight of water vaporized in the boilers, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the end of the stroke of its piston			41. 4506
Difference in per centum of the weight of water vaporized in the boilers, between that weight and the weight of steam accounted for by the indicator in the two large cylinders at the end of the stroke of their pistons			21. 5265

DISTRIBUTION OF THE POWER DURING THE 2,086 HOURS' PERFORMANCE AT SEA, UNDER STEAM ALONE, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3.

Distributing the indicated horses-power developed by the engine during the 2,086 hours' performance at sea, under steam alone, between the 18th of October, 1877, and the 17th of September, 1881, both inclusive, the data being taken from Table No. 3, according to the method hereinbefore described, gives the following results:

	Horses-power.	Per centum of the net horses-power.
Indicated power developed by the engine	916.8481	.....
Power expended in working the engine <i>per se</i>	163.2275	.....
Net power applied to the crank-pins	753.6206	100.00
Power absorbed by the friction of the load	56.5215	7.50
Power expended in overcoming the resistance of the water to the surface of the screw-blades	43.8211	5.81
Power expended in the slip of the screw	82.1477	10.90
Power expended in the propulsion of the vessel	571.1303	75.79
Total	753.6206	100.00

THRUST OF THE SCREW DURING THE 2,086 HOURS' PERFORMANCE AT SEA, UNDER STEAM ALONE, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3.

The thrust of the screw during the above 2,086 hours' performance at sea, under steam alone, between the 18th of October, 1877, and the 17th of September, 1881, both inclusive, calculated according to the method hereinbefore described, is $\left(\frac{8.4361 \times 6086}{60} = 855.7017433 + ; 571.1303 \times 33000 = 18847299.9 ; \text{ and } \frac{18847299.9}{855.7017433} = \right) 22025.5481$ pounds.

DETERMINATION OF THE POWER EXPENDED DURING THE 2086 HOURS' PERFORMANCE AT SEA, UNDER STEAM ALONE, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3, IN OVERCOMING THE RESISTANCE OF THE WATER TO THE EXTERNAL IMMERSSED OR WETTED SURFACE OF THE HULL.

The horses-power expended during the above 2086 hours' performance at sea, under steam alone, between the 18th of October, 1877, and the 17th of September, 1881, both inclusive, in overcoming the resistance of the water to the external immersed or wetted surface of the hull, calculated according to the method hereinbefore described, the mean speed of the immersed surface of the hull due to the inclination of its horizontal water-lines to its longitudinal central plane, deduced from the speed of the vessel, being taken at 14.09467 feet per second, is

$\left(\frac{14.09467^2 \times 0.45}{10^2} = 0.89397, \text{ and } \frac{0.89397 \times 16236.13 \times 855.7017433}{33000} = \right) 376.3691$. Consequently, of the whole power 571.1303 horses applied to the propulsion of the vessel, $\left(\frac{376.3691 \times 100}{571.1303} = \right) 65.8990$ per centum were absorbed by the resistance of the external immersed surface of the hull to the water, and the remaining 34.1010 per centum or 194.7612

horses-power were expended in the displacement of water, and in overcoming the abnormal resistances to the vessel of a gentle swell and a gentle breeze striking the hull at an angle of 35 degrees from ahead.

The resistance of the vessel in function of speed, at all speeds not exceeding 11 geographical miles per hour, being in the ratio of the square of the speed, there can be ascertained from the "distributions of the power" for the various speeds under steam alone, given in Tables Nos. 2 and 4, with the breeze and swell so light as not to sensibly affect the performance, the horses-power required to normally propel the vessel in the present case at the experimental speed of 8.4361 geographical miles per hour, unaffected by wind or current.

The speed of the vessel in Table No. 2 is 11 geographical miles per hour, and the power required to propel it, as given in the distribution of the power, is 1002.8821 horses, deducing from which, in the ratio of the cubes of the speeds, the power required for the speed of 8.4361 geographical miles per hour, there results 452.3722 horses.

The speed of the vessel in Table No. 4 is 8.1805 geographical miles per hour, and the power required to propel it, as given in the distribution of the power, is 411.2162 horses, deducing from which, in the ratio of the cubes of the speeds, the power required for the speed of 8.4361 geographical miles per hour, there results 450.9808 horses.

The mean of the two determinations is $\left(\frac{452.3722 + 450.9808}{2} =\right) 451.6765$ horses-power to normally propel the vessel at the speed of 8.4361 geographical miles per hour. The power actually required to propel it against a gentle swell and gentle breeze was 571.1303 horses, hence $(571.1303 - 451.6765 =) 119.4538$ horses-power were expended in overcoming the resistances of a gentle swell and a gentle breeze when the vessel had a speed of 8.4361 geographical miles per hour. Now, there has been shown that under these conditions 194.7612 horses-power were expended in overcoming these resistances and in the displacement of water; consequently, the latter consumed $(194.7612 - 119.4538 =) 75.3074$ horses-power, which is $\left(\frac{75.3074 \times 100}{451.6765} =\right) 16.6728$ per centum of the normal power required to propel the vessel at the speed of 8.4361 geographical miles per hour, unaffected by wind or current.

Of the power 571.1303 horses required to propel the vessel at the speed of 8.4361 geographical miles per hour, with a gentle swell and a gentle breeze 35 degrees from ahead, there were expended to overcome the abnormal resistances of the swell and breeze $\left(\frac{119.4538 \times 100}{571.1303} =\right) 20.9153$ per centum. Or, to overcome the abnormal resistances of the swell and breeze, an addition of $\left(\frac{119.4538 \times 100}{451.6765} =\right) 26.4468$ per centum was required to the power expended to propel the vessel normally; that is, unaffected by wind or wave.

DISTRIBUTION OF THE POWER DURING THE 442 HOURS' PERFORMANCE AT SEA, UNDER STEAM AND SAIL COMBINED, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3.

Distributing the indicated horses-power developed by the engine during the 442 hours' performance at sea, under steam and sails combined, between the 18th of October, 1877, and the 17th of September, 1881,

both inclusive, the data being taken from Table No. 3, according to the method hereinbefore described, gives the following results:

	Horses-power.	Per centum of the net horses-power.
Indicated power developed by the engine	872.8122	.....
Power expended in working the engine <i>per se</i>	168.3348	.....
Net power applied to the crank-pins	704.4774	100.00
Power absorbed by the friction of the load	52.8358	7.50
Power expended in overcoming the resistance of the water to the surface of the screw-blades	48.0635	6.82
Power expended in the slip of the screw	0.0000	0.00
Power expended in the propulsion of the vessel	603.5781	85.68
Total	704.4774	100.00

THRUST OF THE SCREW DURING THE 442 HOURS' PERFORMANCE AT SEA, UNDER STEAM AND SAIL COMBINED, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3.

The thrust of the screw during the above 442 hours' performance at sea, under steam and sail combined, between the 18th of October, 1877, and the 17th of September, 1881, both inclusive, calculated according to the method hereinbefore described, is $\left(\frac{10.2217 \times 6086}{60} = 1036.8211; 603.5781 \times 33000 = 19918077.3; \text{ and } \frac{19918077.3}{1036.8211} = \right) 19210.7175$ pounds.

DETERMINATION OF THE POWER EXPENDED DURING THE 442 HOURS' PERFORMANCE AT SEA UNDER STEAM AND SAIL COMBINED, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3, IN OVERCOMING THE RESISTANCE OF THE WATER TO THE EXTERNAL IMMERSED OR WETTED SURFACE OF THE HULL.

The horses-power expended during the above 442 hours' performance at sea under steam and sails combined, between the 18th of October, 1877, and the 17th of September, 1881, both inclusive, in overcoming the resistance of the water to the external immersed or wetted surface of the hull, calculated according to the method hereinbefore described, the mean speed of the immersed surface of the hull due to the inclination of its horizontal water lines to its longitudinal central plane, deduced from the speed of the vessel, being taken at 17.07798 feet per second is $\left(\frac{17.07798^2 \times 0.45}{10^2} = 1.31246, \text{ and } \frac{1.31246 \times 16280.13 \times 1036.8211}{33000} = \right) 671.3266$.

POWER EFFECT OF THE SAILS DURING THE 442 HOURS' PERFORMANCE AT SEA UNDER STEAM AND SAILS COMBINED, BETWEEN OCTOBER 18, 1877, AND SEPTEMBER 17, 1881, BOTH INCLUSIVE, AS GIVEN IN TABLE NO. 3.

The resistance of the vessel in function of speed for all speeds not greater than 11 geographical miles per hour, being as the square of the speed, her normal resistance under steam alone and unaffected by wind or current at the experimental speed of 10.2217 geographical miles per hour deduced as a mean from the horses-power required to give the vessel with steam alone the experimental speeds in Tables No. 2 and 4, in the ratio of the cubes of the speeds, are 803.4922. Of these the engine furnished, as has been shown, 603.5781 horses-power, leaving the

pull of the sails to furnish the remaining $(803.4922 - 603.5781 =) 199.9141$ horses-power. Thus, of the total resistance of the hull at the speed of 10.2217 geographical miles per hour, the steam pressure overcame $\left(\frac{603.5781 \times 100}{803.4922} =\right) 75.1193$ per centum, and the wind pressure overcame the remaining $\left(\frac{199.9141 \times 100}{803.4922} =\right) 24.8807$ per centum.

The power required to overcome the resistance of the water to the external immersed surface of the hull at the above speed was, as has been determined, 671.3266 horses; consequently, of the total horses-power 803.4922 required to propel the vessel $\left(\frac{671.3266 \times 100}{803.4922} =\right) 83.5511$ per centum was absorbed by the resistance of the water to the immersed surface of the hull, and the remaining 16.4489 per centum was expended in the displacement of water.

The statical pull of the sails on the vessel at the above speed was $\left(\frac{199.9141 \times 33000}{1036.8211} =\right) 6362.8772$ pounds.

All the deductions as regard the power effect of the sails are on the supposition that the resistance of the hull under the experimental conditions of wind and sea was the same as it would have been at the same speed in smooth water and calm air. If that resistance, however, was greater under the experimental conditions than the normal resistance, then the pull of the sails on the vessel would be correspondingly greater than given by the foregoing calculations, and the propelling value of the sails would be that much more.

TABLE No. 4.—*Containing the data and results of the performance of the United States steam ship Trenton at sea, under steam alone, with the small cylinder and one of the large cylinders in operation, the other large cylinder being disabled by the breaking of its main cross-head.*

[The aggregate time of steaming was 370 hours between the 12th of March and the 5th of September, both inclusive, 1877. The condition of the sea was a light swell, and the wind was a light breeze 41 degrees from ahead. As the steam was not excluded from the valve chest of the disabled cylinder, and as there was no certainty that its valves precisely covered the ports, there might have been leakage of steam to the condenser; consequently, as there can be no certainty in that respect, the economic performance is not given, but only the power performance which is entirely reliable, owing to the very great number of indicator diagrams taken, the mean pressures from which are given below.]

VESSEL.

Vessel's draught of water, in feet and inches:

Forward	19'
Mean	19' 10"
Aft	20' 8"
Vessel's area of greatest immersed transverse section, in square feet.....	695
Vessel's displacement, in tons.....	3,585.96
Vessel's external immersed or wetted surface, in square feet.....	16,192.13

STEAM PRESSURES IN CYLINDERS, PER INDICATOR.

Indicated pressure on the piston of the small cylinder, in pounds per square inch	14
Net pressure on the piston of the small cylinder, in pounds per square inch	12.5
Indicated pressure on the piston of the large cylinder, in pounds per square inch	7.8
Net pressure on the piston of the large cylinder, in pounds per square inch	6.3
Mean indicated pressure on the piston of the large cylinder equivalent to the sum of that pressure and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the areas of these pistons...	15.6559
Mean net pressure on the piston of the large cylinder equivalent to the sum of that pressure and of the net pressure on the piston of the small cylinder reduced in the ratio of the areas of these pistons.....	13.3143
Number of double strokes made per minute by the pistons of the engine.	34.4867

HORSES-POWER.

Indicated horses-power developed by the small cylinder.....	311. 6580
Net horses-power developed by the small cylinder.....	278. 2661
Indicated horses-power developed by the large cylinder	309. 4396
Net horses-power developed by the large cylinder	249. 9320
Indicated horses-power developed by the engine	621. 0976
Net horses-power developed by the engine	528. 1981

SPEED.

Speed of the vessel per hour in geographical miles of 6,086 feet	8. 1805
Slip of the screw in per centum of the speed, calculated for a pitch of 26.5 feet	9. 2047

DISTRIBUTION OF THE POWER DURING THE ABOVE PERFORMANCE.

Distributing the indicated horses-power developed by the engine during the above performance, with steam alone, and only the small cylinder and one large cylinder in operation, according to the method hereinbefore described, gives the following results:

	Horses-power.	Per centum of the net horses-power.
Indicated power developed by the engine	621. 0976	
Power expended in working the engine <i>per se</i>	92. 8995	
Net power applied to the crank-pins.....	528. 1981	100. 00
Power absorbed by the friction of the load	39. 6149	7. 50
Power expended in overcoming the resistance of the water to the surface of the screw-blades	35. 6785	6. 76
Power expended in the slip of the screw.....	41. 6885	7. 89
Power expended in the propulsion of the vessel	411. 2162	77. 85
Total	528. 1981	100. 00

THRUST OF THE SCREW DURING THE ABOVE PERFORMANCE.

The thrust of the screw during the above performance, calculated according to the method hereinbefore described, is

$$\left(\frac{8.1805 \times 6086}{60} = 829.7753833; 411.2162 \times 33000 = 13570134.6; \right.$$

and

$$\frac{13570134.6}{829.7753833} =) 16353.9855 \text{ pounds.}$$

DETERMINATION OF THE POWER EXPENDED IN OVERCOMING THE RESISTANCE OF THE WATER TO THE IMMERSED EXTERNAL OR WETTED SURFACE OF THE HULL.

The horses-power expended during the above performance in overcoming the resistance of the water to the immersed external or wetted surface of the hull, calculated according to the method hereinbefore described, the mean speed of the immersed surface of the hull due to the inclination of its horizontal water-lines to its longitudinal central plane,

deduced from the speed of the vessel, being taken at 13.6676 feet per second, is

$$\left(\frac{13.6676^2 \times 0.45}{10^2} = 0.840615 \right)$$

and

$$\frac{0.840615 \times 16192.13 \times 829.7753833}{33000} = 342.2597.$$

Now, according to the distribution of the power during this performance, there were expended in propelling the vessel 411.2162 horses-power, of which the above 342.2597 horses power were absorbed by the immersed external or wetted surface of the hull in overcoming its resistance to the water, leaving 68.9565 horses-power expended in displacing water; consequently, of the power expended in propelling the

vessel, $\left(\frac{342.2597 \times 100}{411.2162} = \right)$ 83.2311 per centum were absorbed by the surface resistance of the hull, and $\left(\frac{68.9565 \times 100}{411.2162} = \right)$ 16.7689 per centum were applied to equilibrate the direct resistance of the hull.

TABLE No. 5.—*Containing the data and results of the performance of the United States steamship Trenton at sea, under steam and square sails combined, with the small cylinder and one of the large cylinders in operation, the other large cylinder being disabled.*

[The aggregate time of this performance was 102 hours, between the 12th of March and the 5th of September, both inclusive, 1877. The condition of the sea was a moderate swell, and the wind was a moderate breeze 110 degrees from ahead.]

VESSEL.

Vessel's draught of water, in feet and inches:

Forward	18' 9"
Mean	19' 9"
Aft	20' 9"
Vessel's area of greatest immersed transverse section, in square feet.....	691
Vessel's displacement, in tons.....	3,563.11
Vessel's external immersed or wetted surface, in square feet	16,148.13

STEAM PRESSURES IN CYLINDERS, PER INDICATOR.

Indicated pressure on the piston of the small cylinder, in pounds per square inch	13.70
Net pressure on the piston of the small cylinder, in pounds per square inch	12.20
Indicated pressure on the piston of the large cylinder, in pounds per square inch	7.64
Net pressure on the piston of the large cylinder, in pounds per square inch	6.14
Mean indicated pressure on the piston of the large cylinder, equivalent to the sum of that pressure and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the areas of these pistons.....	15.3275
Mean net pressure on the piston of the large cylinder, equivalent to the sum of that pressure and of the net pressure on the piston of the small cylinder reduced in the ratio of the areas of these pistons.....	12.9859
Number of double strokes made per minute by the pistons of the engine.....	38.5090

HORSES-POWER.

Indicated horses-power developed by the small cylinder	340.5505
Net horses-power developed by the small cylinder	303.2639
Indicated horses-power developed by the large cylinder	338.4428
Net horses-power developed by the large cylinder	271.9946
Indicated horses-power developed by the engine	679.9933
Net horses-power developed by the engine	578.2585

SPEED.

Speed of the vessel per hour, in geographical miles of 6,086 feet.....	9.8147
Slip of the screw in per centum of its speed, calculated for a pitch of 26.5 feet	2.4451

DISTRIBUTION OF THE POWER DURING THE ABOVE PERFORMANCE.

Distributing the indicated horses-power developed by the engine during the above performance, with steam and square sails combined, and with only the small cylinder and one large cylinder in operation, according to the method hereinbefore described, gives the following results:

	Horses-power.	Per centum of the net horses-power.
Indicated power developed by the engine.....	679.9933	
Power expended in working the engine <i>per se</i>	101.7348	
Net power applied to the crank-pins	578.2585	100.00
Power absorbed by the friction of the load	43.3694	7.50
Power expended in overcoming the resistance of the water to the surface of the screw-blades	49.6641	8.59
Power expended in the slip of the screw.....	11.8642	2.05
Power expended in the propulsion of the vessel	473.3608	81.86
Total	578.2585	100.00

THRUST OF THE SCREW DURING THE ABOVE PERFORMANCE.

The thrust of the screw during the above performance with steam and sails combined, calculated according to the method hereinbefore described, is $\left(\frac{9.8147 \times 6086}{60} = 995.5377366; 473.3608 \times 33000 = 15620906.4; \right.$
and $\left. \frac{15620906.4}{995.5377366} = \right) 15,690.9234$ pounds. This, however, is not the equivalent of the resistance of the vessel; it is only that portion of this resistance which was overcome by the steam, and to it must be added the unknown pull of the sails in pounds in order to obtain the resistance of the vessel.

DETERMINATION OF THE POWER EXPENDED IN OVERCOMING THE RESISTANCE OF THE WATER TO THE IMMERSSED EXTERNAL OR WETTED SURFACE OF THE HULL.

The horses-power expended during the above performance in overcoming the resistance of the water to the immersed external or wetted surface of the hull, calculated according to the method hereinbefore described, the mean speed of the immersed surface of the hull due to the inclination of its horizontal water lines to its longitudinal central plane, deduced from the speed of the vessel, being taken at 16.398 feet per second, is

$$\left(\frac{16.398^2 \times 0.45}{10^2} = 1.2100248 \text{ and } \frac{1.2100248 \times 16148.13 \times 995.5377366}{33000} = \right) 589.4681.$$

POWER EFFECT OF THE SAILS.

If the resistance of the vessel between the speeds of 8.1805 and 9.8147 geographical miles per hour be taken to vary as the square of the speed, which was indeed the experimental fact, then, as the resist-

ance at the former speed when propelled by steam alone was 16,353.9855 pounds, it will be 23,540.5809 pounds at the latter speed. Of these 23,540.5809 pounds, the thrust of the screw furnished 15,690.9234 pounds, leaving the pull of the sails to furnish the remaining 7,849.6575 pounds. Thus, of the total resistance of the hull at the speed of 9.8147 geographical miles per hour, the steam pressure overcame

$\left(\frac{15690.9234 \times 100}{23540.5809} = \right)$ 66.6548 per centum, and the wind pressure overcame the remaining $\left(\frac{7849.6575 \times 100}{23540.5809} = \right)$ 33.3452 per centum.

The horses-power developed by the sails were

$\left(\frac{7849.6575 \times 995.5377366}{33000} = \right)$ 236.8070, the whole of which was applied to the propulsion of the vessel, and which being added to the 473.3608 horses-power applied by the steam-engine to the propulsion of the vessel, makes a total of 710.1678 horses-power thus applied. Of these, 589.4681 horses-power were absorbed by the resistance of the water to the external immersed or wetted surface of the hull, leaving the remaining 120.6997 horses-power to be applied to the displacement of water. Assuming the accuracy of these determinations, there was, of the total power—steam and sails—expended in the propulsion of the hull, $\left(\frac{589.4681 \times 100}{710.1678} = \right)$ 83.0041 per centum absorbed by the resistance of the water to the external immersed or wetted surface of the hull, and $\left(\frac{120.6997 \times 100}{710.1678} = \right)$ 16.9959 per centum expended in the displacement of water.

TABLE No. 6.—*Containing the data and results of the four hours' trial of the motive machinery of the United States steamship Trenton, made on the 1st of February, 1877, with the vessel, at her lightest draught of water, secured to the dock of the New York navy-yard.*

[Six boilers in use. A considerable portion of the screw was out of water.]

TOTAL QUANTITIES.

Duration of the trial, in consecutive hours.....	4
Total number of double strokes made by the pistons of the engine.....	9965
Total number of pounds of anthracite consumed.....	15740
Total number of pounds of refuse from the anthracite in ash, clinker, soot, and dust.....	2688
Total number of pounds of combustible or gasifiable portion of the anthracite consumed.....	13052
Per centum of the anthracite in refuse of ash, clinker, soot, and dust...	17. 0775

ENGINE.

Steam pressure in the boilers, in pounds per square inch above atmosphere	58
Steam pressure in the receiver, in pounds per square inch above atmosphere.....	0. 312
Proportion of the throttle-valve open.....	Wide
Fraction completed of the stroke of the piston of the small cylinder when the steam was cut off.....	0. 424
Fraction completed of the stroke of the piston of the small cylinder when the steam was cushioned.....	0. 900
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cut off.....	0. 600
Fraction completed of the stroke of the pistons of the large cylinders when the steam was cushioned.....	0. 800
Number of times the steam was expanded.....	7. 6344
Barometer, in engine-room, in inches of mercury.....	29. 92
Vacuum in the condensers, in inches of mercury.....	23. 50
Pressure in the condensers in pounds per square inch above zero.....	3. 15
Number of revolutions made per minute by the circulating pumps.....	146. 5
Number of double strokes made per minute by the pistons of the engine.	41. 5208

TEMPERATURES.

Temperature, in degrees Fahrenheit, of the air on deck.....	52
Temperature, in degrees Fahrenheit, of the air in the engine-room	107
Temperature, in degrees Fahrenheit, of the air in the fire-room	121
Temperature, in degrees Fahrenheit, of the injection water	36
Temperature, in degrees Fahrenheit, of the discharge water.....	86
Temperature, in degrees Fahrenheit, of the feed water.....	109

RATE OF COMBUSTION.

Pounds of anthracite consumed per hour.....	3935
Pounds of combustible consumed per hour.....	3263
Pounds of anthracite consumed per hour per square foot of grate surface	10.6640
Pounds of combustible consumed per hour per square foot of grate surface	8.8428
Pounds of anthracite consumed per hour per square foot of heating surface	0.4411
Pounds of combustible consumed per hour per square foot of heating surface	0.3658

STEAM PRESSURES IN THE SMALL CYLINDER PER INDICATOR.

Pressure on the piston of the small cylinder at the commencement of its stroke, in pounds per square inch above zero.....	69.0
Pressure on the piston of the small cylinder at the point of cutting off the steam, in pounds per square inch above zero.....	49.5
Pressure on the piston of the small cylinder at the end of its stroke, in pounds per square inch above zero.....	25.6
Mean back pressure against the piston of the small cylinder, including cushioning, in pounds per square inch above zero	15.2
Mean back pressure against the piston of the small cylinder during the portion of its stroke before the cushioning began, in pounds per square inch above zero	15.0
Back pressure against the piston of the small cylinder at the point where the cushioning began, in pounds per square inch above zero.....	14.6
Indicated pressure on the piston of the small cylinder, in pounds per square inch	31.0
Net pressure on the piston of the small cylinder, in pounds per square inch	29.5
Total pressure on the piston of the small cylinder, exclusive of cushioning, reduced in the ratio of the stroke of the piston to the fraction of its stroke completed when the cushioning began, in pounds per square inch above zero.....	44.5
Mean total pressure on the piston of the small cylinder developed by the expanded steam alone after the closing of the cut-off valve, in pounds per square inch above zero	33.0

STEAM PRESSURES IN THE TWO LARGE CYLINDERS, PER INDICATOR.

Pressure on the pistons of the large cylinders at commencement of their stroke, in pounds per square inch above zero.....	12.6
Pressure on the pistons of the large cylinders at the point of cutting off the steam, in pounds per square inch above zero.....	10.9
Pressure on the pistons of the large cylinders at the end of their stroke, in pounds per square inch above zero.....	7.5
Mean back pressure against the pistons of the large cylinders, in pounds per square inch above zero.....	4.8
Mean back pressure against the pistons of the large cylinders during the portion of their stroke before the cushioning began, in pounds per square inch above zero	4.5
Back pressure against the pistons of the large cylinders at the point where the cushioning began, in pounds per square inch above zero....	4.3
Indicated pressure on the pistons of the large cylinders, in pounds per square inch.....	5.86
Net pressure on the pistons of the large cylinders, in pounds per square inch	4.36
Total pressure on the pistons of the large cylinders, exclusive of cushioning, reduced in the ratio of the stroke of the pistons to the fraction of their stroke completed when the cushioning began, in pounds per square inch above zero	9.46

HORSES POWER.

Indicated horses-power developed by the small cylinder	830. 8566
Net horses-power developed by the small cylinder	790. 6539
Total horses-power developed by the small cylinder	1192. 6812
Total horses-power developed by the expanded steam alone in the small cylinder	509. 4491
Indicated horses-power developed by the two large cylinders	591. 7888
Net horses-power developed by the two large cylinders	448. 4985
Total horses-power developed by the two large cylinders	650. 1386
Total horses-power developed by the expanded steam alone in the two large cylinders	732. 6086
Indicated horses-power developed by the engine	1422. 6454
Net horses-power developed by the engine	1239. 1524
Total horses-power developed by the engine	1842. 8198
Total horses-power developed by the expanded steam alone in the engine	1240. 0577

ECONOMIC RESULTS.

Pounds of anthracite consumed per hour per indicated horse-power	2. 7660
Pounds of anthracite consumed per hour per net horse-power	3. 1756
Pounds of anthracite consumed per hour per total horse-power	2. 1353
Pounds of combustible consumed per hour per indicated horse-power	2. 2936
Pounds of combustible consumed per hour per net horse-power	2. 6333
Pounds of combustible consumed per hour per total horse-power	1. 7707

WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR.

Pounds of steam present per hour in the small cylinder at the point of cutting off the steam, calculated from the pressure there	20368. 0342
Pounds of steam present per hour in the small cylinder at the end of the stroke of its piston, calculated from the pressure there	23306. 7527
Pounds of steam condensed per hour in the small cylinder to furnish the heat transmuted into the total horses-power developed in that cylinder by the expanded steam alone	1367. 5385
Sum of the two immediately preceding quantities	24674. 2912
Pounds of steam present per hour in the two large cylinders at the end of the stroke of their pistons, calculated from the pressure there	23756. 8878
Pounds of steam condensed per hour in the small cylinder and in the two large cylinders to furnish the heat transmuted into the total horses-power developed in those three cylinders by the expanded steam alone	3248. 8158
Sum of the two immediately preceding quantities	27005. 7036

DIFFERENCE BETWEEN THE WEIGHT OF WATER VAPORIZED IN THE BOILERS AND THE WEIGHT OF STEAM ACCOUNTED FOR BY THE INDICATOR IN THE CYLINDERS.

Pounds of water vaporized per hour in the boilers on the supposition that each pound of combustible vaporized 11 pounds of water under the experimental pressure and from the experimental temperature	35893.
Difference in per centum of the weight of water vaporized in the boilers, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the point of cutting off the steam	43. 2534
Difference in per centum of the weight of water vaporized in the boilers, between that weight and the weight of steam accounted for by the indicator in the small cylinder at the end of the stroke of its piston	31. 2560
Difference in per centum of the weight of water vaporized in the boilers, between that weight and the weight of steam accounted for by the indicator in the two large cylinders at the end of the stroke of their pistons	24. 7605

PER CENTUM OF TOTAL PRESSURE ON PISTONS UTILIZED AS INDICATED AND AS NET PRESSURES.

Mean indicated pressure on the pistons of the two large cylinders, equivalent to the sum of the indicated pressure on those pistons and of the indicated pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder	14. 5576
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Mean net pressure on the pistons of the two large cylinders, equivalent to the sum of the net pressure on those pistons and of the net pressure on the piston of the small cylinder reduced in the ratio of the combined areas of the pistons of the two large cylinders to the area of the piston of the small cylinder	12.6368
Mean total pressure which applied to the combined areas of the pistons of the two large cylinders would produce the total horses-power developed by the engine	19.2911
Per centum of the mean total pressure utilized as indicated pressure....	75.4628
Per centum of the mean total pressure utilized as net pressure	65.5059

PERFORMANCE OF THE CIRCULATING-PUMPS DURING THE ABOVE DOCK TRIAL OF THE MOTIVE MACHINERY.

The temperature of the injection water being 36 degrees Fahrenheit, and that of the discharge water 86 degrees, there were taken out by each pound of injection water delivered into the condenser, say, 50 Fahrenheit units of heat. Now there went from the large cylinders into the condenser 35893 pounds of steam per hour, at the average pressure of, say, 6.7 pounds per square inch above zero, carrying with them say, 1167.3 Fahrenheit units of heat per pound weight of steam; and as the temperature of the feed water was 109 degrees Fahrenheit, there remained 1058.2 Fahrenheit units of heat to be taken out of each pound weight of steam by the injection water, which required

$$\left(\frac{1058.3}{50} \times 35893 = \right)$$

759711 pounds of injection water per hour, or 12662 pounds per minute. As the pumps made 146.5 revolutions per minute, they delivered per revolution nearly $86\frac{1}{2}$ pounds of water.

DISTRIBUTION OF THE POWER DURING THE ABOVE DOCK TRIAL OF THE MOTIVE MACHINERY.

The distribution of the indicated horses-power during the above dock trial of the machinery gives the power expended by the screw in the displacement of water, this power being what remains of the indicated horse-power after deduction of all the frictions, including the resistance of the water to the screw surface.

	Horses-power.	Per centum of the net horses-power.
Indicated horses-power developed by the engine.....	1422.6454	.....
Power expended in working the engine, <i>per se</i>	183.4930	.....
Net power applied to the crank pins.....	1239.1524	100.00
Power absorbed by the friction of the load	92.9364	7.50
Power expended in overcoming the resistance of the water to the surface of the screw-blades.....	62.2482	5.02
Power expended in the displacement of water.....	1083.9678	87.48
Total	1239.1524	100.00

THRUST OF THE SCREW DURING THE ABOVE DOCK TRIAL OF THE MOTIVE MACHINERY.

During the above dock trial the work done by the screw in the displacement of water, the vessel being stationary, was $(1083.9678 \times 33000 =)$ 35770937.4 foot-pounds per minute. The speed of this displacement was the axial speed of the screw or $(41.5208 \text{ revolutions per minute} \times 26.5 \text{ feet pitch} =)$ 1100.3012 feet per minute; consequently, the thrust of the screw was

$$\left(\frac{35770937.4}{1100.3012} = \right) 32510.1321 \text{ pounds.}$$

DOCK TRIAL OF THE SCREW OF THE TRENTON TO ASCERTAIN ITS RESISTANCE TO MOVEMENT WITH THE VESSEL STATIONARY, AND AT HER AVERAGE CRUISING DRAUGHT OF WATER.

The Trenton having been fully repaired and equipped at the New York navy-yard for a cruise, a trial was made of her machinery on the 2d of October, 1883, during a few hours, with the vessel secured stationary to the navy-yard wharf. The bunkers were filled with coal, and all the weights were on board except the *personnel* and the paymaster's stores, so that the vessel was at about her mean cruising draught of water. Advantage was taken of this opportunity to ascertain the pressure and power required under the conditions to make different numbers of revolutions of the screw per minute, rising from 24 to 42, increasing by three revolutions per minute at a time. Three sets of indicator diagrams were taken at each speed, and the mean pressure from them was assumed to be the indicated pressure for the respective speeds. The object was to ascertain the law of the increased net pressure required for the increased number of revolutions of the screw per minute, and the relative resistances of the screw to movement with the vessel stationary at the wharf, and in free route at the same draught of water.

The results of the trials showed that the net pressure upon the pistons of the motive engine increased exactly in the ratio of the square of the number of revolutions made per minute by the screw up to 42, which was the highest limit of the trials. The indicated and net pressures deduced from all the diagrams taken at all the speeds gave, for the speed of 42 revolutions of the screw per minute, the following for the indicated and net pressures in pounds per square inch of the pistons of the two large cylinders, the corresponding pressures for the piston of the small cylinder having been reduced and added to those experimentally obtained for the pistons of the two large cylinders. From these pressures and for the aggregate area of the pistons of the two large cylinders the corresponding horses-power have been calculated.

Number of double strokes made per minute by the pistons of the motive engine	42
Indicated pressure on the pistons of the two large cylinders, in pounds per square inch	18.8101
Net pressure on the pistons of the two large cylinders, in pounds per square inch	16.8892
Indicated horses-power developed by the motive engine	1,817.6074
Net horses-power developed by the motive engine	1,631.9921

DISTRIBUTION OF THE POWER DURING THE ABOVE DOCK TRIAL OF THE MOTIVE MACHINERY.

The distribution of the indicated horses-power during the above dock trial of the machinery gives the power expended by the screw in the displacement of water, this power being what remains of the indicated horses-power after deduction is made of the powers required to work the engine, *per se*, or unloaded, to overcome the friction of the load, and to overcome the cohesive resistance of the water to the surface of the screw-blades.

	Horses-power.	Per centum of the net horses-power.
Indicated horses-power developed by the engine.....	1, 817. 6074	.....
Power expended in working the engine, <i>per se</i>	185. 6153	.....
Net power applied to the crank-pins.....	1, 631. 9921	100. 00
Power absorbed by the friction of the load.....	122. 3994	7. 50
Power expended in overcoming the resistance of the water to the surface of the screw-blades.....	64. 4322	3. 95
Power expended in the displacement of water.....	1, 445. 1605	88. 55
Total.....	1, 631. 9921	100. 00

THRUST OF THE SCREW DURING THE ABOVE DOCK TRIAL OF THE MOTIVE MACHINERY.

During the above dock trial the work done by the screw in the displacement of water, the vessel being stationary, was $(1445.1605 \times 33000 =)$ 47690296.5 foot-pounds per minute. The speed of this displacement was the axial speed of the screw, or $(42 \text{ revolutions per minute} \times 26.5 \text{ feet pitch} =)$ 1,113 feet per minute; consequently, the thrust of the screw was

$$\left(\frac{47690296.5}{1113} = \right) 42848.4245 \text{ pounds.}$$

RELATIVE RESISTANCES OF THE SCREW TO MOVEMENT WITH THE VESSEL STATIONARY AT THE DOCK AND IN FREE ROUTE UNDER THE NORMAL CONDITIONS OF AVERAGE DRAUGHT OF WATER, SMOOTH SEA, AND CALM AIR.

The normal conditions of smooth water and calm air, as nearly as practically possible to obtain, were present during the performances given in Tables Nos. 2 and 4. In Table No. 2 the net pressure upon the pistons of the two large cylinders equivalent to the combined net pressure upon them and upon the piston of the small cylinder was 12.1545 pounds per square inch, the pistons making 46.1570 double strokes per minute. Now, assuming the net pressures upon the pistons to be as the squares of the number of double strokes made in equal time, under normal conditions, then for the 42 double strokes per minute made during the dock trial the net pressure would have been $(46.1570^2 : 12.1545 :: 42^2 :)$ 10.0629 pounds per square inch with the vessel in free route.

And, similarly, in Table No. 4, the equivalent net pressure upon the pistons of the large cylinders being, when reduced, 6.6572 pounds per square inch, and the number of double strokes of the pistons being 34.4867 per minute; then, for the 42 double strokes per minute made during the dock trial, the net pressure would have been $(34.4867^2 : 6.6572 :: 42^2 :)$ 9.8760 pounds per square inch with the vessel in free route.

The mean of the two determinations is

$$\left(\frac{10.0629 + 9.8760}{2} = \right) 9.9694$$

pounds per square inch of pistons for the net pressure with which they would have made 42 double strokes per minute, the vessel being in free route under normal conditions. Now, to make 42 double strokes per minute with the vessel stationary at the dock, there were required the equivalent net pressure of 16.8892 pounds per square inch, showing that

for an equal number of double strokes of pistons in equal time, the net pressure upon them required to be

$$\left(\frac{16.8892 - 9.9694 \times 100}{9.9694} = \right)$$

69.4104 per centum greater when the vessel was stationary at the dock than when it was in free route under normal conditions.

Or, with the same net pressure upon the pistons, they will make with the vessel in free route under normal conditions ($\sqrt{1.694104} =$) 1.3016 times the number of double strokes per minute, as with the vessel stationary at the dock.

SPEED AND ENDURANCE OF THE VESSEL, ETC.

The maximum speed which can be permanently maintained in smooth water and uninfluenced by wind or current, with half the provisions and coal consumed, burning merchantable Welsh semi-bituminous coal, is $12\frac{1}{2}$ geographical miles per hour, or 300 geographical miles per day. The consumption of coal at this speed being 60 tons per day, and the bunkers containing 330 tons, the vessel carries coal enough for $5\frac{1}{2}$ days' steaming, and can make a voyage under these conditions of 1,650 geographical miles.

When steaming with the same coal at sea under the conditions of ordinary service, the average speed under steam alone was 8.4361 geographical miles per hour, or $202\frac{1}{2}$ geographical miles per day (about two-thirds of the maximum speed in smooth water). The consumption of coal being $27\frac{1}{5}$ tons per day, the vessel could steam $12\frac{1}{8}$ days and make a distance of 2,455 geographical miles.

The vessel could average under steam alone with maximum power produced by merchantable Welsh semi-bituminous coal, under the usual conditions at sea, 11.6 geographical miles per hour, or $278\frac{1}{2}$ geographical miles per day, with a consumption of 60 tons of coal per day, at which speed the coal would last $5\frac{1}{2}$ days and the vessel make a distance of 1,532 geographical miles.

If anthracite be burned instead of Welsh semi-bituminous coal, the above results will be considerably decreased because of the less rate of combustion of the former and greater proportion of refuse than in the case of the latter.

The maximum speed which can be permanently maintained in smooth water and uninfluenced by wind or current, with half the provisions and coal consumed, burning merchantable anthracite, is $11\frac{1}{8}$ geographical miles per hour, or 268 geographical miles per day. The consumption of anthracite at this speed being 45 tons per day and the bunkers containing 340 tons (10 tons more than of semi-bituminous coal, on account of the greater density of anthracite), the vessel carries coal enough for 7.55 days' steaming, and can make a voyage under these conditions of 2,025 geographical miles.

The vessel could average under steam alone, with maximum power produced by merchantable anthracite, under the usual conditions at sea, $10\frac{3}{8}$ geographical miles per hour, or 249 geographical miles per day, with a consumption of 45 tons of anthracite per day, at which speed the anthracite would last 7.55 days and the vessel make a distance of 1,881 geographical miles.

At all speeds not greater than 11 geographical miles per hour, the resistance of the vessel in function of speed was as the square of the speed, and the power to overcome the resistance was as the cube of the

speed; but, after passing the speed of 11 geographical miles per hour, the resistance in function of speed increased in a higher ratio than the duplicate, and the power consequently increased in a correspondingly higher ratio than the triplicate. At the speed of 12.612 geographical miles per hour, under normal conditions, the vessel had a resistance of 43,613.1514 pounds (Table No. 1), and at the speed of 11 geographical miles per hour, her resistance was 29,661.3174 pounds (Table No. 2); consequently, for these speeds, the resistance of the vessel was in the 2.819 power of the speed instead of the 2 power, as in the case of all speeds less than that of 11 geographical miles per hour. And the horses-power required to propel the vessel at these speeds (1,686.3010 for the 12.612 miles, and 1,002.8821 for the 11 miles) were in the 3.819 power of the speed instead of the 3 power, as in the case of all speeds less than that of 11 geographical miles per hour. The vessel had not the form and proportions for a higher speed than 11 geographical miles per hour, and any speed above that limit had to be obtained by a disproportionally increased expenditure of power.

Of the total resistance of the vessel at all speeds not exceeding 11 geographical miles per hour, 82.6364 per centum was composed of the resistance of the water to its external immersed or wetted surface, leaving the remaining 17.3636 per centum composed of the resistance of the water to displacement. But at the speed of 12.612 geographical miles per hour, with the abnormally increased resistance of the vessel at that speed, 70.934 per centum of its total resistance was due to its external immersed surface, and the remaining 29.066 per centum to the displacement of water.

The screw was exceedingly well proportioned to the vessel and to the engine when anthracite was the fuel consumed. Under normal conditions its slip was $9\frac{3}{4}$ per centum of its axial speed, taking its pitch at 26.5 feet; and the power required to be expended for overcoming the resistance of the water to its helicoidal surface was 6.70 per centum of the net horses-power developed by the engine, which, added to the 8.03 per centum expended in the slip, made 14.73 per centum of the net horses-power for the loss of useful effect by the screw. This is as little as can be obtained in practice, and when added to the 7.50 per centum absorbed by the friction of the load, leaves of the net horses-power developed by the engine, 77.77 per centum applied to the propulsion of the vessel.

For the maximum power developed by the Trenton with Welsh semi-bituminous coal, each square foot of grate surface produced

$$\left(\frac{2414.3079}{492} = \right) 4.90713$$

indicated horses-power. And of the total weight of the machinery each

$$\left(\frac{2207200.}{2414.3079} = \right) 914.2164$$

pounds were required to produce one indicated horse-power.

Respectfully submitted by, sir, your obedient servants,

B. F. ISHERWOOD, *Chief Engineer.*

THEO. ZELLER, *Chief Engineer.*

GEO. P. HUNT, *Chief Engineer.*

The CHIEF OF THE BUREAU OF STEAM ENGINEERING,

Navy Department.

No. 16.—BUREAU OF PROVISIONS AND CLOTHING.

NAVY DEPARTMENT,
BUREAU OF PROVISIONS AND CLOTHING,
Washington, D. C., October 29, 1883.

SIR: I have the honor to submit a report of the transactions of this Bureau for the fiscal year ending June 30, 1883.

PROVISIONS.

Amount appropriated for the year	\$1, 000, 249 33
Amount received from settlement of accounts in the Fourth Auditor's Office.....	709 31
Total amount received under provisions.....	<u>1, 000, 958 64</u>
Amount transferred from the appropriation provisions to general account of advances, on account of expenditures by pay officers abroad, during the year	726, 727 99
Amount transferred in the settlement of accounts in the Fourth Auditor's Office	312 01
Amount expended by the Bureau, as per requisitions	<u>273, 918 64</u>
Total amount expended under provisions	<u>1, 000, 958 64</u>
Amount expended by pay officers abroad :	
For commuted rations to officers.....	98, 042 22
For commuted rations to crew.....	420, 389 16
For commuted rations to marines	45, 003 00
For surrendered rations to crew and marines	53, 546 07
For provisions purchased.....	242, 399 73
For freight on provisions, labor and expenses of storehouses.....	5, 479 84
	<u>864, 860 02</u>
Amount expended by the Bureau :	
For commuted rations to officers.....	25, 568 70
For commuted rations to crew.....	1, 148 10
For provisions purchased.....	161, 001 95
For freight on provisions, labor and expenses of inspections.....	86, 199 89
	<u>273, 918 64</u>
Amount of commuted rations paid to crews on board ships, at 30 cents..	420, 389 16
Cost of rations issued to crews on board ships, at 30.15 cents.....	413, 371 40
Amount of commuted rations paid to marines on board ships, at 30 cents..	45, 003 00
Cost of rations issued to marines on board ships, at 30.15 cents.....	60, 104 68
Amount of commuted rations stopped on account of sick in hospital, and credited to the hospital fund.....	13, 042 78
Amount of provisions issued to officers' messes.....	<u>7, 758 50</u>
Amount expended by pay officers abroad, and paid for from general account of advances, during the fiscal year 1883.....	864, 860 02

Amount transferred, up to this date, from the appropriation provisions to general account of advances, on account of expenditures abroad, during the fiscal year 1883.....	\$726,727 99
Amount due general account of advances, at this date, on account of the fiscal year 1883.....	138,132 03
Amount of commuted rations stopped on account of sick in hospital, and credited to the hospital fund.....	13,042 78
Amount due on contracts.....	30,570 52
Total debits under provisions.....	181,745 33
Deduct amount due for provisions issued to officer's messes.....	7,758 50
Deficiency under provisions.....	173,986 83

CLOTHING FUND.

Balance on hand July 1, 1882.....	387,696 67
Amount transferred from general account of advances to the clothing fund, on account of issues on board ships, during the fiscal year 1882-1883.....	169,181 46
Amount received from settlement of accounts in Fourth Auditor's Office.....	315 89
Amount received from sales of clothing.....	3,132 44
Total amount received under clothing.....	560,326 46
Amount transferred from the clothing fund to general account of advances, on account of purchases by pay officers abroad, during the fiscal year 1882-1883.....	8,105 69
Amount expended by Bureau, as per requisition.....	207,634 87
Total amount expended.....	215,740 56
Balance on hand July 1, 1883.....	344,585 90
Cost of clothing purchased by pay officers abroad, and paid for from general account of advances, during the fiscal year 1883.....	4,951 71
Amount transferred up to this date, from the clothing fund to general account of advances, on account of purchases abroad, during the fiscal year 1883.....	3,455 17
Amount due general account of advances, at this date, on account of the fiscal year 1883.....	1,496 54
Cost of clothing issued on board ships, during the fiscal year 1883.....	229,584 73
Amount transferred up to this date from general account of advances to the clothing fund, on account of issues on board ships, during the fiscal year 1883.....	181,577 22
Amount due the clothing fund, at this date, on account of the year 1883.....	48,007 51
Deduct amount due general account of advances, as stated above.....	1,496 54
Balance due the clothing fund at this date on account of 1883.....	46,510 97

SMALL-STORE FUND.

Balance on hand, July 1, 1882.....	99,685 92
Amount transferred from general account of advances to the small-store fund, on account of issues on board ships, during the fiscal years 1882 and 1883.....	49,766 66
Amount received from settlement of accounts in the Fourth Auditor's Office.....	39 84
Amount received from sales of small stores.....	114 04
Total receipts under small-stores.....	149,606 46

Amount transferred from the small-store fund to general account of advances, on account of purchases by pay officers abroad, during the fiscal years 1882 and 1883.....	\$3,477 99
Amount expended by Bureau, as per requisitions.....	19,078 53
Total amount expended	22,556 52
Balance on hand July 1, 1883.....	127,049 94
Cost of small stores purchased by pay officers abroad, and paid for from general account of advances, during the fiscal year 1883	5,318 17
Amount transferred, up to this date, from the small-store fund to general account of advances, on account of purchases abroad, during the fiscal year 1883	1,988 33
Amount due general account of advances on account of 1883, at this date.....	3,329 84
Cost of small stores issued on board ships, during the fiscal year 1883..	74,009 18
Amount transferred, up to this date, from general account of advances to the small-store fund, on account of issues on board ships, during the fiscal year 1883.....	56,348 73
Amount due small-store fund, at this date, on account of the year 1883..	17,660 45
Deduct amount due general account of advances, as stated above.....	3,329 84
Balance due small-store fund, at this date, on account of the year 1883	14,330 61

CONTINGENT.

Amount appropriated for the year.....	50,000 00
Amount received from settlement of accounts in the Fourth Auditor's Office	87 34
Total amount received under contingent.....	50,087 34
Amount transferred from the appropriation contingent to general account of advances, on account of expenditures by pay officers abroad, during the year 1883	3,490 83
Amount expended by the Bureau, as per requisitions	15,057 66
Total amount expended	18,548 49
Balance on hand at this date	31,538 85

The amount paid for commuted rations (\$576,477.06) exceeds one-half the total amount appropriated for provisions. The estimates for provisions include for commuted rations only one-fifth the number of men, boys, and marines, and the officers who are employed on duty entitling them to commutation of rations.

A comparison with previous years shows a rapid increase in payments for commuted rations, thus: Amount paid for commuted rations during the year 1882-'83, \$576,477.06; amount paid for commuted rations during the year 1880-'81, \$510,791.44; increase \$65,685.62. The statute authorizes commutation to (1) officers; (2) midshipmen; (3) the sick. (See sections 1577, 1578, and 1583 Rev. Stat.) The price at which rations shall be commuted is fixed at 30 cents. (Section 1585 Rev. Stats). It does not appear from the terms of the law that Congress contemplated the commutation of the ration to a greater extent than is provided in the above quoted sections, or, at most beyond the estimates of this Bureau. The unlimited commutation now practiced on many vessels of war results in the deterioration and final condemnation of quantities of provisions procured by the Department, in pursuance of law, as a military necessity. The Bureau therefore recommends, as a measure of economy,

that the regular commutation of the ration shall be limited by law to one-fifth the number of enlisted men, and to commissioned and warrant officers when attached to sea-going ships.

The system now in practice, which provides for the purchase of provisions from enlisted men by disbursing officers of the Government, is one which involves complication in provision accounts, and occasions much loss of provisions which are furnished at the expene of Government. The provisions are supposed to be drawn as rations from the Government, without cost to the men, and afterwards sold to the Government by the enlisted men who surrender them. Practically these provisions are not drawn, never pass to the possession of the men, and the vouchers on which these provisions are paid for are fictitious.

This system has no foundation in law; like the excessive commutation of rations it results in waste of good provisions provided at Government expense, and presents the additional objection of irregular and fictitious vouchers, which are condemned by statute law. The Bureau recommends the absolute prohibition of this practice.

A discussion of the merits of the above-mentioned practice of excessive commutation and the sale of provisions to enlisted men is not called for here. It is pertinent to remark that the question of providing greater variety in the Navy ration has no direct bearing on the recommendations of the Bureau.

Every article in the Navy ration has been introduced upon the advice of competent scientific experts. It cannot be materially changed in quantity or variety until its value shall be increased by Congress. And although science may point out other articles of food, valuable for the better sustenance, either of undeveloped boys or mature men, which are not embraced in the present ration list, the practical question how to pack them for preservation in store and on ship-board would remain unsettled. If additional variety is the desideratum, then the commutation of one-fifth of the rations would enable the proper disbursing officer to expend the amount commuted in providing such additional articles of food for immediate consumption as may be deemed most suitable to meet the wants of the crew.

Great improvement has been made in the clothing for the enlisted men of the Navy under the present system of manufacture at the New York navy-yard. Other changes are contemplated by the Bureau, in this system, with a view of improving the quality and reducing the cost of clothing.

For several years past the freight on provisions has been paid from the appropriation provisions, and the freight on all other stores belonging to the Bureau from the appropriation contingent. When provisions are shipped other stores belonging to the Bureau are almost invariably shipped at the same time; and thus it becomes necessary to prorate the amount of freight between the two appropriations and to make out two sets of bills. To simplify this, and to obviate the necessity for the double labor, it is recommended that the appropriation be so changed as to pay all freight from the appropriation contingent, and that that appropriation be increased to \$60,000 from \$40,000, the amount appropriated for the current year. The amount paid for freight during the last year from the appropriation provisions was between \$15,000 and \$16,000.

I have the honor to submit, also, estimates of appropriations marked A, B, C, D, and E for the support of the Bureau for the fiscal year ending June 30, 1885; together with schedules, numbered from 1 to 4, in-

clusive, of proposals received, and statement, numbered 5, of contracts made on account of the Bureau during the fiscal year ended June 30, 1883.

Very respectfully, your obedient servant,

J. A. SMITH,
Paymaster-General, U. S. Navy.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Provisions and Clothing.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be re- quired for each detailed object of expenditure.	Amount appropri- ated for the cur- rent fiscal year ending June 30, 1884.
A.—EXPENSES OF THE BUREAU OF PROVISIONS AND CLOTHING.		
For salary of chief clerk, per act of July 5, 1862 (12 Stat. at L., p. 511, sec. 3)	\$1,800 00	
For salary of one clerk of class four, per act of July 23, 1866 (14 Stat. at L., p. 208, sec. 8)	1,800 00	
For salary of two clerks of class three, per act of July 23, 1866 (14 Stat. at L., p. 208, sec. 8)	3,200 00	
For salary of two clerks of class two, per act of July 23, 1866 (14 Stat. at L., p. 208, sec. 8)	2,800 00	
For salary of three clerks of class one, per act of July 23, 1866 (14 Stat. at L., p. 208, sec. 8)	3,600 00	
For salary of one clerk of class one, per act of March 3, 1883	1,200 00	
For salary of two copyists, per act of March 3, 1883	1,800 00	
For salary of messenger, per act of March 3, 1883	720 00	
For salary of laborer, per act of March 3, 1883	660 00	
For salary of file and blank clerk (submitted)	1,000 00	
	18,580 00	\$17,580 00
*B.—CONTINGENT EXPENSES OF THE BUREAU.		
For blank books, stationery, and miscellaneous items (submitted)	600 00	
For furniture, desks, book and file cases, and books for reference (submitted)	500 00	
	1,100 00	
C.—PROVISIONS, NAVY, BUREAU OF PROVISIONS AND CLOTHING.		
To pay 1,100 officers for commuted rations, being on duty and entitled to the same, at 30 cents per day	120,450 00	
To pay 1,650 men and boys for commuted rations, being one-fifth of the number allowed, at 30 cents per day	180,675 00	
To pay 200 marines for commuted rations, being one-fifth of the number on duty entitling them to a ration, at 30 cents per day	21,900 00	
For the purchase of rations for 7,400 men, boys, and marines, expenses of inspection, and storehouses, and for water for drinking and cooking on board ships	876,975 00	
	1,200,000 00	1,100,000 00
D.—CONTINGENT, BUREAU OF PROVISIONS AND CLOTHING.		
For freight on shipments, candles, fuel, books, and blanks, stationery, advertising, furniture for inspections and pay offices in navy-yards, foreign postage, telegrams, express charges, tolls, ferriage, car tickets, yeomen's stores, iron safes, newspapers, ice, and other expenses not enumerated, per act of March 3, 1883	60,000 00	
	60,000 00	40,000 00

* The amount allowed from the appropriation for the Navy Department for the contingent expenses of the Bureau is absolutely insufficient to supply its actual requirements, and it is urgently recommended the amount asked for be appropriated.

Estimates of appropriations required, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
E.—CIVIL ESTABLISHMENT, BUREAU OF PROVISIONS AND CLOTHING.		
Navy-yard, Boston, Mass.:		
One writer to paymaster, per act of March 3, 1883	\$1, 017 25	
One writer to inspector, per act of March 3, 1883	1, 017 25	
Navy-yard, New York, N. Y.:		
One writer to inspector, per act of March 3, 1883	1, 017 25	
One writer to paymaster, per act of March 3, 1883	1, 017 25	
One writer to paymaster, per act of March 3, 1883	939 00	
One writer in clothing manufacturing room, per act of March 3, 1883..	1, 017 25	
Navy-yard, League Island, Pa.:		
One writer to paymaster, per act of March 3, 1883	1, 017 25	
Navy-yard, Washington, D. C.:		
One writer to paymaster, per act of March 3, 1883	1, 300 00	
Navy-yard, Norfolk, Va.:		
One writer to paymaster, per act of March 3, 1883	1, 017 25	
One writer to inspector, per act of March 3, 1883	1, 017 25	
Navy-yard, Mare Island, California:		
One writer to paymaster, per act of March 3, 1883	1, 017 25	
One writer to inspector, per act of March 3, 1883	1, 017 25	
	12, 411 50	\$6, 000 00

No. 1.—Schedule of proposals for miscellaneous supplies under advertisement dated October 7, 1882.

Names.	500 barrels beef $\frac{1}{2}$ in $\frac{1}{2}$ barrels.	1,000 bar- rels pork, $\frac{1}{2}$ in $\frac{1}{2}$ barrels.	30,000 pounds pre- served beef.	15,000 pounds rice.	12,000 pounds pickles.	100,000 pounds sugar, $\frac{1}{2}$ in $\frac{1}{2}$ barrels.	50,000 pounds coffee.	6,000 gallons beans.	4,000 gallons molasses.	5,000 gallons vinegar.	2,000 yards thin flannel.
Foerhenbach & Co.*			Per pound.	Per pound.	Per pound.		Per pound.	Per gallon.	Per gallon.	Per gallon.	Per yard.
Stephen R. Post		\$24 00			*\$0 07		\$0 10.35			\$0 15	
J. J. O'Donohue							10.47				
Chas. H. Arnold*				\$0 07 $\frac{1}{10}$		\$0 09.48			\$0 78		
Seth M. Milliken									†54.82		
Havemyer Sugar Company									†52	16.99	
Burger, Hurlburt & Livingston				06 $\frac{1}{4}$		{ whole, 09.23 } { half, 09 $\frac{3}{4}$ }	10 $\frac{1}{2}$		†58		
Thurber & Co.				*06.24		{ whole, 09.10 } { half, 09.62 }	10.23		†54.47		
R. M. Masterton*						{ whole, 09 $\frac{1}{2}$ } { half, 10 }					
Horace A. Foote					gall., 40					18 $\frac{3}{4}$	
A. L. McGuire								bush, \$2 35			
F. E. McAllister									†65		
J. N. McKnight & Co.				06 $\frac{3}{4}$	09. $\frac{1}{2}$	09 $\frac{1}{2}$	10.27	*42	76	*14	\$0 75
Austin P. Brown*	*\$20 75 { 23 95 12 48 }	*21 80 25 23 13 11	*\$0 13 $\frac{3}{4}$	06.97	09.24				71.98	17 90	
Rowland A. Robbins*											
E. S. Stretch										18 $\frac{3}{4}$	51
James R. Michael*	23 06	22 97	15 $\frac{1}{2}$	06 $\frac{3}{4}$	09	*09 $\frac{5}{16}$	10.03	47	*70	18	
David Babcock & Co.	22 60	23 30	15 $\frac{3}{4}$				11				
B. V. Phippey & Co.*						09 $\frac{9}{10}$	10 $\frac{3}{4}$				*48
J. W. Butler							11			33	
Dell & J. C. Nobbit	10,950 00	24,240 00		1,275 00		11,875 00	5,875 00		1,800 00	1,700 00	

* Contract awarded.

† Informal.

No. 1.—Schedule of proposals for miscellaneous supplies under advertisement dated October 7, 1882—Continued.

Names.	3,000 yards flannel $\frac{1}{2}$ = 11 = oz.	45,000 y'ds cotton duck, 8 = oz.	5,000 y'ds Barnsley sheeting.	5,000 p'rs shoes, calf.	2,000 p'rs shoes, kip.	15,000 p'rs socks, woolen.	1,000 mat- tresses.	80,000 lbs. soap, salt- water.	2,100 spools thread, black.	4,000 spools cotton.	40,000 spools silk, sewing.	1,200 papers needles.
							Each.	Per pound.	Per spool.	Per spool.	Per spool.	Per paper.
J. Freeman & Co.*				\$2 29	\$2 29		\$6 31					
Stephen L. Fogg												
Seth M. Milliken	*\$0 1.22 $\frac{1}{2}$	\$0 16 $\frac{3}{4}$	\$0 95 $\frac{3}{4}$			*\$0 32 $\frac{1}{2}$			\$0 06	\$0 04 $\frac{1}{2}$	\$0 04.9	\$0 04
S. Wilson	1.32	15	98			36			06	04 $\frac{1}{2}$	05 $\frac{1}{4}$	03 $\frac{1}{2}$
Colgate & Company		16 $\frac{1}{2}$						\$0 04.38				
James J. Watson*								04 $\frac{1}{4}$				
F. E. McAllister							5 25					
Gannon Brothers				2 30	2 30							
George H. Creed*		*12.9							07	05		
A. Burgdorf												
J. N. McKnight & Co	1.87		69				6 85					
Austin P. Brown*	1.37 $\frac{1}{2}$	13	95	2 60	2 60	33	5 31					
Rowland A. Robbins*		13.22	76.58	2 57	2 33 $\frac{1}{2}$		4 03	04 $\frac{1}{4}$	06	04 $\frac{1}{4}$	04	03 $\frac{1}{2}$
H. D. Ostermoor & Son*							5 85		05.60			
Chas. McKeone							*5 12 $\frac{1}{2}$					
Chas. W. Copeland*				2 35	*2 25			04.08				
James R. Michael*	1.27.6	12.92	78.7	2 52	2 78	34 $\frac{1}{2}$	5 54	*03.94	*66 per doz	*47 per doz	*44 per doz	*02
B. Y. Pippey & Co.*	1.23	13	79	2 44	2 68	33 $\frac{1}{2}$	5 46	03.96	68 per doz	50 per doz	53 per doz	
Dell & J. C. Nobbit							6,400 00					

* Contract awarded.

No. 1.—Schedule of proposals for miscellaneous supplies under advertisement dated October 7, 1882—Continued.

Names.	2,500 thim- bles.	3,000 jack- knives.	200 razor strops.	1,000 brushes, blackening.	4,000 doz. buttons, dead-eye.	1,800 combs, coarse.	400 kettles, mess.	1,000 tin pots.	1,000 tin pans.	2,000 spoons.	5,000 boxes blackening.	35,000 pounds candles.
Blank and Voelbel.....	Each.	Each.	Each.	Each.	Per doz.	Each.	Each.	Each.	Each.	Each.	Per box.	Per pound.
Seth M. Milliken.....	\$0 24	\$0 29.9		\$0 25	\$0 13	\$0 16					\$0 4.9	\$0 15½
Thurber & Co.....	4											
S. Wilson.....												
Manhattan Oil Company.....												
Rothchild Brothers & Co.*.....				60							* 3 & 4	16½
James Aikman & Co.....							\$0 62	\$0 13	\$0 7½	\$0 3½		
James J. Watson*.....		40	\$0 36	*24	7	15.95	†51	7½	8	18½	3½	
F. E. McAllister.....		†29										
John H. Shields.....		30										
Proctor and Gamble.....												
George H. Creed*.....	1½	*29		24½	12	6½	*51	5.9	6½	2.9	3½	17.45
J. N. McKnight & Co.....				25		12	50	7½	7½		3.4	
Austin P. Brown*.....	1.9	35	23	25	2	8½	62	6½	7½	3	5	*13.9
Roland A. Robbins*.....		29.23		25	1.21		52.98	6.39	7.89	*27½	3½	
J. G. Dreyfus & Co.....												15.99
R. G. Mitchell.....												15½
James R. Michael*.....	*1	†29	*22	24½	*†1 30	*6	†51	6½	8½	3	3.6	14.4
J. W. Butler.....		35		24		15				3	3½	
Dell and J. C. Nobbitt.....											2 25	

* Contract awarded.

† Tie bids decided by lots.

‡ Per great gross.

No. 2.—Schedule of proposals received for 50,000 pounds of tobacco under advertisement dated March 31, 1883.

For 50,000 pounds of tobacco :	Per pound.
P. H. Mayo & Bro	\$0 36
J. P. Williamson	38½
P. Lorillard & Co.*	31
C. W. Spicer	35
Do	33½
Do	31½
David Buckner & Co	32

No. 3.—Schedule of proposals for blue cloth, kip shoes, mattresses, and blankets received under advertisement dated April 2, 1883.

Names.	3,000 yards blue cloth.	2,000 pairs kip shoes.	1,000 mattresses.	5,000 blankets.
	Per yard.	Each.	Each.	Each.
J. Freeman & Co.		\$2 23*†		
C. W. Copeland		2 25		
H. D. Ostermoor & Son			\$4 61*	
Do			5 19	
Do			5 61	
T. A. Ashburner				\$2 53½
Austin P. Brown	\$2 51	2 65		2 43
J. R. Michael	2 52	2 23†	4 73	2 36½*
B. Y. Pippey & Co.	2 39*	2 36	4 29†	2 37

* Contract awarded.

† Decided by lot.

‡ Not according to specification.

No. 4.—Schedule of proposals for fresh provisions, navy bread, baking, and water, received during the fiscal year ending June 30, 1883, the supplies to be delivered during the fiscal year 1883 and 1884.

Names.	Where to be delivered.	Fresh bread.	Fresh beef.	Fresh vegetables.	Navy bread.	Baking flour.	Water.
		Per lb.	Per lb.	Per lb.	Per lb.	Per bbl.	Per gal.
James E. Chase*	Portsmouth, N. H. .	\$0 08	\$0 12	\$0 02			
J. W. Hobbs*	Boston, Mass		14	04½			
Snow & Higgins	do		14	04½			
Horace P. Stevens	do		15½	04½			
Austin & Graves*	do	06					
J. McNamara*	New York, N. Y.	04½				\$1 75	
A. Kavanah †	do	04					
E. Treadwell's Son*	do					93	
C. T. Goodwin	do					93	
C. Desmond	do		10½	03			
J. Rinkleb	do		11.49	02.50			
Jas. J. Lyons	do		09.74	02.49			
P. Sullivan†	do		08.125	01			
Eugene Kahn†	do		11.45	02.41			
Michael Rooney †	do		08.625	01.125			
John Fox†	do		08.375	01			
John Hanley*	do		08½	01½			
C. Strohmaier*	League Island, Pa.	04½					
John Hartman*	do					1 40	
L. S. Boraef*	do		12½	04			
B. Charlton & Co*	Washington, D. C					1 50	
George Seitz & Son*	do	03.99					
Koller & Ginzer	do	04					
G. F. Swift & Co*	do		06¼	02½			
J. Gutman	Norfolk, Va.		11.90	05			
J. Codd†	do		12	05.05			
S. Westheimer	do		12	05.50			
Frank Dusch*	do		11.80	04.50			
J. Reid & Co*	do					1 85	
Wm. Clark*	do						\$0 01
C. T. Cabler	do	06.50					
J. B. Kimberly*	do	05.45					

* Contract awarded.

† Informal.

No. 4.—Schedule of proposals for fresh provisions, &c.—Continued.

Names.	Where to be delivered.	Fresh bread.	Fresh beef.	Fresh vegetables.	Navy bread.	Baking flour.	Water.
		<i>Per lb.</i>	<i>Per lb.</i>	<i>Per lb.</i>	<i>Per lb.</i>	<i>Per bbl.</i>	<i>Per gal.</i>
C. T. Cabler	Fortress Monroe, Va.	\$0 06. 50					
W. H. Kimberly*	do	05½					
Wm. Clark*	do						\$0 01
B. A. Philibut	Pensacola, Fla.				\$0 05½		
F. Bauer	do				06		
Moses White*	do	06					
T. J. Mooney	do				05½		
John S. Bell*	do		\$0 15	\$0 05			
J. O'Neal*	do				05		
J. F. Tobin*	Mare Island, Cal.		07. 9	02. 7			
John Faust*	do	02½					
California Cracker Co.*	do				04. 4		
Henry Christie	do	05					
W. L. Brackett	do		10½	03½			
J. F. Bloomfield	do		18	05			
D. T. Brown, jr	do	03					
Hoffman & Woenne†	do		10½	03½			
Mark Strouse & Co.†	do		08				
Eclipse Cracker Co.†	do				04¾		
H. M. Blumenthal.†	do			01. 26	05		

* Contract awarded.

† Informal.

No. 5.—Statement of contracts made by the Bureau of Provisions and Clothing for and in behalf of the Navy Department during the fiscal year ending June 30, 1883.

Names.	Date.	Articles contracted for.	Price.	Where to be delivered.
	1882.			
M. H. Homiller	July 1	Fresh beef.....per pound..	\$0 11½	Washington, D. C.
Do	July 1	Vegetables.....do.....	02½	Do.
James E. Chase	July 3	Fresh beef.....do.....	12	Portsmouth, N. H.
Do	July 3	Vegetables.....do.....	02	Do.
Do	July 3	Fresh bread.....do.....	06	Do.
Jos. W. Hobbs	July 3	Fresh beef.....do.....	14½	Boston, Mass.
Do	July 3	Vegetables.....do.....	04½	Do.
Austin & Graves	July 3	Fresh bread.....do.....	06	Do.
Do	July 3	Baking, per barrel of flour.....	1 75	Do.
Frank Dusch	July 3	Fresh beef.....per pound..	06 ⁷ / ₁₀	Norfolk, Va.
Do	July 3	Vegetables.....do.....	01 ⁹ / ₁₀₀	Do.
C. T. Cabler	July 3	Fresh bread.....do.....	06 ³ / ₈	Do.
Do	July 3	Fresh bread.....do.....	06½	Fortress Monroe, Va.
L. S. Boraef	July 5	Fresh beef.....do.....	12½	League Island, Pa.
Do	July 5	Vegetables.....do.....	04½	Do.
John Hanley	July 5	Fresh beef.....do.....	14 ²³ / ₁₀₀	New York, N. Y.
Do	July 5	Vegetables.....do.....	03 ²² / ₁₀₀	Do.
William Clark	July 5	Water.....per gallon..	00¾	Fortress Monroe, Va.
Do	July 5	Water.....do.....	01	Norfolk, Va.
Thomas Holmes	July 6	Fresh bread.....per pound..	05	League Island, Pa.
C. T. Goodwin	July 6	Baking, per barrel of flour.....	95	New York, N. Y.
W. L. Hubbard	July 7	Fresh beef.....per pound..	09½	Pensacola, Fla.
Do	July 7	Vegetables.....do.....	04¼	Do.
Moses White	July 7	Fresh bread.....do.....	06	Do.
J. O'Neal	July 7	Navy bread.....do.....	05½	Do.
James Reid	July 8	Baking, per barrel of flour.....	1 46	Norfolk, Va.
J. McNamara	July 10	Fresh bread.....per pound..	06½	New York, N. Y.
B. Charlton & Co	July 10	Fresh bread.....do.....	04½	Washington, D. C.
Do	July 10	Baking, per barrel of flour.....	1 40	Do.
John Faust	July 11	Fresh bread.....per pound..	05	Mare Island, Cal.
California Cracker Company.	July 11	Navy bread.....do.....	05	Do.
John Hartman	July 13	Baking, per barrel of flour.....	1 40	League Island, Pa.
J. F. Tobin	July 14	Fresh beef.....per pound..	08¾	Mare Island, Cal.
Do	July 14	Vegetables.....do.....	03½	Do.
S. M. Milliken	Oct. 31	Flannel, 6-4 11-ounce, 30,000 yards, per yard.	1 22½	New York.
Do	Oct. 31	Woolen socks, 15,000 pairs..per pair..	32½	Do.
R. M. Masterton	Nov. 1	Rice, 15,000 pounds.....per pound..	06 ²⁴ / ₁₀₀	Do.
Rothchild Brothers	Nov. 1	Blacking, 5,000 boxes.....each..	03	Do.
F. Foerhenbach & Co	Nov. 1	Pickles, 12,000 pounds..per pound..	07	Do.
J. J. Walton	Nov. 3	Blacking brushes, 1,000.....each..	24	Do.
James R. Michael	Nov. 3	Sugar, 100,000 pounds ..per pound..	09 ⁵ / ₁₆	Do.
Do	Nov. 3	Coffee, 50,000 pounds.....do.....	10 ⁹³ / ₁₀₀	Do.

No. 5.—Statement of contracts made by Bureau of Provisions and Clothing, &c.—Continued.

Names.	Date.	Articles contracted for.	Price.	Where to be delivered.
	1882.			
James R. Michael. . . .	Nov. 3	S. W. soap, 80,000 pounds, per pound.	\$0 03 ²⁴ / ₁₀₀	New York.
Do.	Nov. 3	Black thread, 2,100 spools . . . each..	05 ¹ / ₂	Do.
Do.	Nov. 3	Cotton thread, 4,000 spools. . . do. . .	03 ¹ / ₂	Do.
Do.	Nov. 3	Sewing silk, 40,000 spools. . . do. . .	03 ³ / ₈	Do.
Do.	Nov. 3	Needles, 1,200 papers. do. . .	02	Do.
Do.	Nov. 3	Tbimbles do. . .	01	Do.
Do.	Nov. 3	Razor strops, 200 do. . .	22	Do.
Do.	Nov. 3	D. E. buttons, 4,000 dozen, per great gross.	1 30	Do.
Do.	Nov. 3	Coarse combs, 1,800 each..	06	Do.
J. Freeman & Co.	Nov. 6	Calf shoes, 5,000 pairs. per pair..	2 29	Do.
C. W. Copeland	Nov. 7	Kip shoes, 2,000 pairs. do. . .	2 25	Do.
B. Y. Pippey & Co. . . .	Nov. 8	Thin flannel, 2,000 yards. . . per yard..	48	Do.
Rowland A. Robbins. . . .	Nov. 10	Spoons, 2,000 each..	02 ⁷ / ₈	Do.
Do.	Nov. 10	Barnsley sheeting, 5,000 yards, per yard.	76 ⁵⁸ / ₁₀₀	Do.
George H. Creed.	Nov. 11	Mess kettles, 400 each..	51	Do.
Do.	Nov. 11	Cotton duck, 45,500 yards. per yard..	12 ² / ₁₀	Do.
Do.	Nov. 11	Tin pots, 1,000 each..	05 ² / ₁₀	Do.
Do.	Nov. 11	Tin pans, 1,000 do. . .	06 ¹ / ₂	Do.
Do.	Nov. 11	Jack-knives, 3,000 each..	29	Do.
Austin P. Brown.	Nov. 11	Beef, 500 barrels. per barrel..	20 75	Do.
Do.	Nov. 11	Pork, 1,000 barrels. do. . .	21 80	Do.
Do.	Nov. 11	Preserved beef, 30,000 pounds, per pound.	13 ¹ / ₄	Do.
Do.	Nov. 11	Vinegar, 5,000 gallons. . . per gallon..	14	Do.
Do.	Nov. 11	Candles, 35,000 pounds. . . per pound..	13 ² / ₁₀	Do.
Do.	Nov. 18	Beans, 6,000 gallons. per gallon..	42	Do.
J. R. Michael	Dec. 9	Molasses, 4,000 gallons. do. . .	70	Do.
H. D. Ostermoor & Son	Dec. 11	Mattresses, 1,000 each..	5 12 ¹ / ₂	Do.
	1883.			
J. R. Michael	May 17	Blankets, 5,000 do. . .	2 36 ¹ / ₂	Do.
J. Freeman & Co.	May 22	Kip shoes, 2,000 pairs. per pair..	2 23	Do.
H. D. Ostermoor & Son	May 25	Mattresses, 1,000 each..	4 61	Do.
P. Lorillard & Co.	May 29	Tobacco, 50,000 pounds. per pound..	31	Do.
B. Y. Pippey & Co. . . .	June 29	Blue cloth, 3,000 yards. . . per yard..	2 39	Do.

No. 18.—THE MARINE CORPS.

HEADQUARTERS UNITED STATES MARINE CORPS,
COMMANDANT'S OFFICE,
Washington, D. C., October 1, 1883.

SIR: I have the honor to submit my annual report of the condition of the United States Marine Corps.

On October 1, 1883, there were 1,887 enlisted men in the Corps, 883 of whom were on board ships in commission, and 1,004 doing duty at the several shore stations.

During the past year there have been 888 enlistments, 131 re-enlistments, 431 discharges, 16 deaths, and 564 desertions.

I urgently invite attention to my report of last year in reference to an increase of privates, as great inconvenience continues to be felt for want of them. At the navy-yards and on board of vessels in commission there is a demand for more men, which I am unable to supply. The service suffers accordingly. No other action than an increase of appropriation is needed, the number required being already allowed by law. I hope that Congress at this session may consent to give us this increase.

Congress at its last session having authorized the appointment of eight more second lieutenants, with the understanding that the whole number provided for by law should hereafter be appointed, I have, agreeably to your instructions, caused the estimates to be made for 30 second lieutenants as formerly.

An appropriation for barracks and quarters at the Norfolk navy-yard is urgently needed. A large building, in a suitable position, now there, can easily be converted into a commodious barrack building, and quarters for officers can be built upon several vacant spaces in the navy-yard. An estimate for this will be submitted.

The reports of inspections at the different posts and of guards of vessels returning from cruises, made by the adjutant and inspector, show an excellent state of efficiency and discipline, which my own personal inspection at the posts confirms.

The officers are zealous and attentive to duty, and the men (though not enough in number to do all that is required of them) are yet willing and subordinate, and elicit marked praise whenever they appear in public, or are called on in any emergency.

I trust that the regulations drawn up by the recent Naval Board convened for that purpose may be approved, as they are greatly needed to properly define our duties on shore and afloat.

The recent appointment of officers from the Naval Academy is a long desired step in advance, and is one which it is believed will have excellent results for the service at large.

Recruiting has been carried on at Boston, New York, Philadelphia, and Mare Island, California, with moderate success during the past year; in all, 888 privates have been enlisted, of whom many are now rendering efficient service.

The limited number of men available, however, forces the sending to sea of those who have not been a sufficient time enlisted to be well-

drilled soldiers. Men ought to be one year in garrison before joining a ship for sea service. Every effort is required to instruct the men in target practice, and with good results.

In consequence of an epidemic of yellow fever at the navy-yard and reservation, Pensacola, Fla., the detachment serving at that yard has been moved into camp some miles distant, after sustaining a loss of five privates. It is now free from disease, and it is hoped may continue so until frost sets in.

First Lieut. A. S. Taylor, in command of this detachment, deserves much credit for his efficient and officerlike conduct in this emergency.

One captain has been retired and one first lieutenant has resigned. With the consequent promotions, no other changes have taken place in the active list, other than the appointment of the second lieutenants before mentioned.

The annual estimates for the support of the Corps were forwarded to the Navy Department on the 28th of September last.

Very respectfully, your obedient servant,

C. G. McCawley,
Colonel Commandant.

Hon. Wm. E. Chandler,
Secretary of the Navy, Washington, D. C.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1885, by the quartermaster's department, United States Marine Corps.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1884.
PROVISIONS.			
For 1,000 non-commissioned officers, musicians, privates, and washerwomen, 365 days, at one ration per day, is 365,000 rations; at 19 cents per ration.....	\$69,350 00		
For difference between the cost of rations at 19 cents and commutation at \$1 for one enlisted man employed as clerk to colonel commandant, 365 days, is 365 rations; at 81 cents per ration, is.....	295 65		
For difference between the cost of rations at 19 cents and commutation at 75 cents for eight enlisted men employed as clerks and messengers, in commandant's, adjutant and inspector's, paymaster's, and quartermaster's offices, Washington, D. C., and assistant quartermaster's offices, Philadelphia, Pa., 365 days, is 2,920 rations; at 56 cents per ration, is.....	1,635 20		
For difference between the cost of rations at 19 cents and commutation at 50 cents for three enlisted men, employed as above, 365 days, is 1,095 rations; at 31 cents per ration, is.....	339 45		
		\$71,620 30	\$60,000
NOTE.—Commutation in lieu of rations in kind at the rate of \$1, 75, and 50 cents to the above enlisted men, is authorized by order of the Navy Department, June 28, 1880.			
CLOTHING.			
For 2,000 non-commissioned officers, musicians, and privates, at \$42.80 per annum, actual cost.....	85,600 00		
For 500 overcoats, at \$10.03 each.....	5,015 00		
		90,615 00	77,000
FUEL.			
For 3,894 cords of wood as follows: 1 colonel commandant, 1 colonel, 2 lieutenant-colonels, 4 majors, 3 staff majors, 2 staff captains, 12 captains, 15 first lieutenants, 15 second lieutenants, 1,000 non-commissioned officers, musicians, privates, and washerwomen, 6 hospitals, 1 armory, 5 mess-rooms for officers, 16 offices for commandant and staff and commanding officers of			

Estimates of appropriations required for the service of the fiscal year, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Total amount to be appropriated under each head of appropriation.	Amount appropriated for the current fiscal year ending June 30, 1884.
FUEL—Continued.			
posts, 9 rooms for officers of the day, 9 guard-rooms at barracks and navy-yards, 3 stores for clothing and other supplies; one fourth additional on 2,400 cords, the quantity supposed to be required in latitude north 36 degrees, from 1st September to 30th April, 600 cords, amounting in all to 3,894 cords; at \$6 per cord, is.....		\$23,364 00	\$18,000
MILITARY STORES.			
For pay of one chief armorer, at \$3 per day, \$939; 3 mechanics, at \$2.50 each per day, \$2,347.50; in all.....	\$3,286 50		
For purchase of military equipments, such as cartridge-boxes, bayonet scabbards, haversacks, blanket-bags, canteens, musket-slings, swords, drums, bugles, flags, &c.....	9,000 00		
For purchase of 100 Springfield rifles, caliber .45, at \$15 each.....	1,500 00		
For purchase of ammunition.....	1,000 00		
For purchase and repair of instruments for band, and purchase of music.....	500 00		
		15,286 50	9,786 50
TRANSPORTATION AND RECRUITING.			
For transportation of troops and the expenses of the recruiting service.....		10,000 00	10,000 00
REPAIR OF BARRACKS.			
At Portsmouth, N. H.; Boston, Mass.; Brooklyn, N. Y.; League Island, Pa.; Annapolis, Md.; headquarters and navy-yard, Washington, D. C.; Gosport, Va.; and Mare Island, California.....	10,000 00		
Rent of building used for manufacture of clothing, store for supplies, and offices of assistant quartermasters, Philadelphia, Pa..	2,000 00		
Hire of quarters for 6 enlisted men, employed as clerks and messengers at headquarters, Washington, D. C., and assistant quartermaster's offices, Philadelphia, Pa., at \$21 each per month.....	1,512 00		
Hire of quarters for 3 enlisted men, employed as above, at \$10 each per month.....	360 00		
		13,872 00	10,000 00
NOTE.—Hire of quarters at \$21 and \$10 per month, for the above enlisted men, authorized by order of the Navy Department, dated June 28, 1880.			
FORAGE.			
For forage in kind for 4 horses of the quartermaster's department and the authorized number of officers' horses.....		5,400 00	5,400 00
CONTINGENCIES.			
For gas and oil at marine barracks, Portsmouth, N. H.; Boston, Mass.; Brooklyn, N. Y.; League Island, P.; assistant quartermaster's offices, Philadelphia, Pa.; Annapolis, Md.; headquarters and navy-yard, Washington, D. C.; Gosport, Va.; Pensacola, Fla.; and Mare Island, California.....	4,742 85		
For water at marine barracks, Boston, Mass.; Brooklyn, N. Y.; Annapolis, Md.; and Mare Island, California.....	1,051 95		
For straw for bedding for enlisted men at the various posts.....	1,037 07		
For furniture for Government houses.....	5,000 00		
For freight, ferriage, toll, cartage, funeral expenses of marines, stationery, telegraphing, rent of telephones, apprehension of deserters, per diem to enlisted men employed on constant labor, repairs of gas and water fixtures, office and barrack furniture, mess utensils for enlisted men, packing-boxes, wrapping-paper, oilcloth, crash, rope, twine, carpenters' tools, tools for police purposes, purchase and repair of hose, repairs to public carry-all, purchase and repair of harness, repair of fire extinguishers, purchase and repair of hand-carts and wheelbarrows, purchase and repair of cooking stoves, ranges, &c., stoves where there are no grates, purchase of ice, towels, and soap for offices, improving parade grounds, repair of pumps and wharves, laying drain and water pipes, introducing gas, and for other purposes..	18,423 89	30,255 76	25,000 00

QUARTERMASTER'S OFFICE, UNITED STATES MARINE CORPS,
Washington, D. C., September 26, 1883.
 Respectfully submitted.

W. B. SLACK,
Quartermaster, Marine Corps.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Paymaster United States Marine Corps.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be re- quired for each detailed object of expenditure.	Total amount to be appropriated un- der each head of appropriation.	Amount appropri- ated for the cur- rent fiscal year ending June 30, 1884.
Pay of officers on the active list: For one colonel commandant, one colonel, two lieutenant-colonels, one adjutant and inspector, one quartermaster, one paymaster, four majors, two assistant quartermasters, one judge-advocate- general United States Navy, nineteen captains, thirty first lieutenants, and thirty second lieutenants, per acts of June 30, 1834, 4 Stat., p. 713, secs. 4, 5; March 2, 1847, 9 Stat., p. 155, sec. 3; August 5, 1854, 10 Stat., p. 586, sec. 1; February 2, 1857, 11 Stat., p. 163, sec. 1; July 17, 1862, 12 Stat., p. 594, sec. 2; June 30, 1864, 13 Stat., p. 144, sec. 1; March 3, 1865, 13 Stat., p. 487, sec. 1; July 28, 1866, 14 Stat., p. 334, sec. 37; July 28, 1866, 14 Stat., p. 337, sec. 13; March 2, 1867, 14 Stat., p. 422, sec. 37; July 15, 1870, 14 Stat., p. 517, sec. 1; January 18, 1875, 18 Stat., p. 301, sec. 7; Navy regulations, July 18, 1816; R. S., p. 271, secs. 1596, 1623.....		\$196, 440	
Pay of officers on the retired list: For one colonel, three majors, two assistant quartermasters, three captains, two first lieutenants, and three second lieuten- ants, same acts		27, 748	
Pay of non-commissioned officers, musicians, and privates: For one sergeant-major, one quartermaster-sergeant, one leader of the band, one drum-major, fifty first sergeants, one hundred and forty sergeants, one hundred and eighty corporals, thirty musicians, ninety-six drummers and fifers, and one thousand five hundred privates, same acts		389, 052	
Pay of civil force: For ten clerks and two messengers, same acts		16, 035	
Undrawn clothing: For payments to discharged soldiers for clothing undrawn, same acts		20, 000	
Transportation: For transportation of officers traveling under orders without troops, same acts		8, 000	
Commutation of quarters: For commutation of quarters for officers, where there are no pub- lic buildings		10, 000	
		667, 275	\$642, 985

HEADQUARTERS MARINE CORPS, PAYMASTER'S OFFICE,
September 25, 1883.
Respectfully submitted.

GREEN CLAY GOODLOE,
Major and Paymaster, Marine Corps.

HEADQUARTERS UNITED STATES MARINE CORPS,
COMMANDANT'S OFFICE,
Washington, D. C., November 20, 1883.

SIR: I transmit herewith duplicate estimates for a deficiency in the appropriation for "provisions Marine Corps" for the fiscal year 1883; also duplicate estimates for the amount required by the quartermaster's department to pay "for hire of quarters of officers serving with troops where there are no public quarters," together with explanatory letters from the quartermaster, Marine Corps, in each case.

Very respectfully, your obedient servant,

C. G. McCawley,
Colonel Commandant.

Hon. WM. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

UNITED STATES MARINE CORPS,
QUARTERMASTER'S OFFICE,
Washington, D. C., November 19, 1883.

SIR: I respectfully submit, for transmittal to the honorable Secretary of the Navy, duplicate estimates for deficiency of appropriation for "provisions Marine Corps," fiscal year 1883.

Congress appropriated for "provisions Marine Corps, 1883," \$68,013.10. Of this sum there was drawn on requisitions to pay accounts for rations furnished, \$65,137.99, and \$2,875.11 transferred to the Bureau of Medicine and Surgery to pay for rations stopped on account of naval hospitals, making a total of \$68,013.10, the amount appropriated. The sum now asked (\$961.41) is to pay the monthly reservations of 20 per cent. withheld from accounts paid the contractor, J. A. McInnis, and \$917.54 is to pay the Bureau of Medicine and Surgery, the sum due for rations stopped at the several marine stations on account of naval hospitals, during the months of April, May, and June, 1883, making a total of \$1,878.95.

I am, very respectfully, your obedient servant,

W. B. SLACK,
Quartermaster, Marine Corps.

The COLONEL COMMANDANT,
United States Marine Corps, Headquarters.

DEFICIENCIES.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1883, by the quartermaster's department, United States Marine Corps.

Provisions:

To pay account rendered by J. A. McInnis for rations furnished to marines at Mare Island, California, fiscal year ending June 30, 1883, being the amount of monthly reservations withheld from bills paid him during the year.....	\$961 41
To pay amount due the Bureau of Medicine and Surgery, U. S. N., for rations stopped at the several marine stations on account of naval hospitals during the months of April, May, and June, 1883.....	917 54

1,878 95

QUARTERMASTER'S OFFICE,
Washington, November 19, 1883.
Respectfully submitted.

W. B. SLACK,
Quartermaster, Marine Corps.

UNITED STATES MARINE CORPS,
QUARTERMASTER'S OFFICE,
Washington, D. C., November 20, 1883.

SIR: I respectfully submit, for transmittal to the honorable Secretary of the Navy, duplicate estimates, amounting to \$6,000, for the "hire of quarters" for officers serving with troops, where there are not sufficient quarters possessed by the United States to accommodate them, for the fiscal year ending June 30, 1884.

This estimate is made necessary by the "act making appropriations for the support of the Army for the fiscal year ending June 30, 1884," approved March 3, 1883, which only allows "commutation of quarters for officers on duty without troops at places where there are no public quarters," and by General Order No. 83, A. G. O., dated December 18, 1880, which says: "Officers on duty with troops not in the field will be furnished with quarters in kind when public quarters are available; but in cases where there are not sufficient quarters possessed by the United States to accommodate them, the Quartermaster's Department shall hire the necessary quarters for such officers unprovided therewith."

The paymaster of the corps asked and obtained an appropriation of \$10,000 for "commutation of quarters for officers where there are no public buildings," but declines to pay commutation of quarters to officers serving with troops.

I am, very respectfully, your obedient servant,

W. B. SLACK,
Quartermaster, Marine Corps.

The COLONEL COMMANDANT,
United States Marine Corps, Headquarters.

Estimates of appropriations required for the service of the fiscal year ending June 30, 1884, by the quartermaster's department, United States Marine Corps.

HIRE OF QUARTERS.

For hire of quarters for officers serving with troops, where there are no public quarters belonging to the Government, and where there are not sufficient quarters possessed by the United States to accommodate them..	\$6,000
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No. 18.—NAVAL ACADEMY.

REPORT OF THE SUPERINTENDENT.

UNITED STATES NAVAL ACADEMY,
Annapolis, Md., October 24, 1883.

SIR : I have the honor to report that the course of instruction prescribed for the past year has been carried out; that fifty-four cadets completed the four years' course and were detached from the Academy in June last, to perform two years' service afloat, six of them completing the course "with distinction" and eighteen "with credit." Thirty-five of this class entered as cadet-midshipmen and nineteen as cadet-engineers.

Previous to the passage of the law of August 5, 1882, separate courses of instruction were prescribed for cadet-midshipmen and cadet-engineers, but since that date all the cadets of a class have pursued the same course of instruction.

A new course of instruction for naval cadets was adopted by the Academic Board in April last and approved by the Department, but was not put fully into operation until the 1st instant, the beginning of the present academic year.

Under this new system the number of studies pursued during the four years' course is the same as in the course pursued in 1881-'82, except dropping out theoretical naval architecture (which was an elective study), but the studies have been so arranged as to reduce the number to be pursued during any one year.

During the first year (fourth class) the reduction is one study in each term; during the second year (third class) one study in the first term and two studies in the second term; during the third year (second class) five studies in each term; during the fourth year (first class) the number of studies has been increased one in the first term, but reduced four in the second term. It is believed that this change will be beneficial to the cadets. The usual summer practice cruise was made by the cadets in the sailing ships *Constellation* and *Dale*, except by that portion of the present second class that entered as cadet-midshipmen.

The ships cruised at sea and in Chesapeake Bay, visiting only the port of Portsmouth, N. H. The cadets of the first class were instructed in the duties of junior officers and petty officers in cruising vessels of war, and those of the junior classes in the duties of seamen. Copies of the reports of the commanding officers of the practice ships are forwarded herewith, marked A and B.

The cadets retained at the Academy during the summer months were daily instructed in mechanical work in the steam-engineering shops and in running and managing steam launches, and were also instructed in the management of pivot guns.

On the 30th of January last a mutinous demonstration was made by the cadets, upon the publication of an order of the Superintendent depriving a cadet officer of his rank for misconduct. The details of the

demonstration and the disciplinary measures adopted were reported to the Department February 20, 1883.

Ten cadets of the third class (seven of whom were dismissed and three otherwise punished) were found guilty in September last, by a court-martial, of hazing cadets of the fourth class on board of the *Constellation* during the summer cruise.

Necessary repairs have been made to the public buildings as far as practicable during the year. The walls of the house known as the Superintendent's quarters have been rebuilt and roofed in. The armory building has been completed. The roof of the large hospital building on "the farm" has been repaired. The old frame buildings formerly used as the armory and the bakery have been taken down. The bridge across College Creek has been thoroughly repaired. A sea-wall has been built partially around the Naval Cemetery to protect the banks. The drill and parade ground has been filled in, graded, and sodded. The drainage has received much attention, and the sewer under the lower cadet quarters has been removed. The uniform of the cadets, which has heretofore been made by contract, is now all made at the Academy under the direct supervision of the storekeeper. Besides a reduction in price, uniformity in cut, fit, color, and quality is obtained.

Ninety-four candidates for admission presented themselves in May last and one hundred and twenty in September. Of this number one declined appointment, five withdrew, one was refused examination for being of bad moral character, sixty-nine failed to pass the required mental examination, and thirty-three were found physically deficient. The physical defects of ten were waived by the Department. One hundred and fifteen were admitted and appointed naval cadets.

The great advantage gained by the cadets of the fourth class who entered in time to make the summer practice-cruise causes me to renew my recommendation that all candidates for admission to the Academy shall be directed to report for examination on the 15th day of May in each year. It is also recommended that members of Congress shall be notified as soon as vacancies may occur, and of vacancies that will occur, in order that persons may be selected for appointment in time to prepare for the examination.

In this connection it is suggested that it would be beneficial to the Navy and to the cadets if the law of August 5, 1882, should be so modified that the selection of cadets who are to fill vacancies in the lower grades of the line and Engineer Corps of the Navy and of the Marine Corps shall be made upon the completion of the four years' course instead of upon the completion of the six years' course. This change would send to sea in the cruising ships only cadets to be retained in the service, and would give the Navy a more efficient corps of junior officers. Many of the cadets, while performing the two years' service afloat, know that they will not be retained in the Navy, and they naturally feel little or no interest in their duties. I beg leave to again respectfully call your attention to the great disparity in pay of those final graduates who after completing their six years' course are assigned to the lower grades of the line and Engineer Corps of the Navy and of the Marine Corps. When at sea, an ensign (junior grade) receives \$1,000 per annum, an assistant engineer \$1,700 per annum, and a second lieutenant of marines \$1,400 per annum. When on shore duty, an ensign (junior grade) receives \$800 per annum, an assistant engineer \$1,400 per annum, and a second lieutenant of marines \$1,400 per annum.

The first assignments of final graduates under the law of August 5, 1882, was made in June last; seven were assigned as ensigns (junior grade), three as assistant engineers, and ten as second lieutenants in the Marine Corps.

An examination of the Navy Register will show that at the present rate of promotion it will be at least fifteen years before the senior graduate assigned to the line can receive the same rate of pay per annum as was at once received by those members of his class who were assigned to the Engineer Corps and to the Marine Corps.

I am, sir, very respectfully, your obedient servant,

F. M. RAMSAY,
Captain, U. S. N., Superintendent.

Hon. W. E. CHANDLER,
Secretary of the Navy, Washington, D. C.

UNITED STATES PRACTICE-SHIP CONSTELLATION (3D RATE),
Off Naval Academy, Annapolis, Md., August 31, 1883.

SIR: I have the honor to submit the following report of the cruise of this vessel during the past summer:

The ship sailed from Annapolis June 16, beat down the bay, and finally went to sea on the 25th of June.

On July 1 ran into the Delaware Breakwater to land an invalid who prevented our exercises. July 17 arrived at Portsmouth, N. H.; sailed thence July 31; arrived in Chesapeake Bay August 11, and at Annapolis August 28.

The weather has been generally pleasant, though a few moderate gales were experienced. Fogs prevailed from Nantucket Shoals to Portsmouth, and there were also some days of calm weather. All of this gave the varied experience so essential to a practice cruise.

In Portsmouth Commodore Wells gave every facility to the cadets to visit the various workshops and buildings, as well as the dry-dock. The Omaha, hauled up on the marine railway undergoing repairs, and the Plymouth in the ship-house were practical illustrations. Commodore Wells and the officers of that station did everything to make the visit instructive and agreeable. The fine, bracing climate of Portsmouth in summer makes it a very desirable place for the practice-ships to rendezvous.

In order to give proper marks, the first class were marked in conduct by myself; the seamanship notes and mates of deck, by the executive officer; in navigation, log-books, and signals, by the navigator; in "attention to duty," duties as officers of the deck, fore-castle, and boat, as midshipmen of the watch and top, by the officers of the deck who observed them.

The second, third, and fourth classes were divided in sections and assigned to the different watch officers, who regularly examined them weekly. The conduct marks for all classes were given by myself.

COURSE OF INSTRUCTION.

FIRST CLASS.

Seamanship.—Written notes on various evolutions and duties; signals, night and day; midshipmen's duties and duties of petty officers, occasionally in charge of deck.

Navigation.—Log-books, days' work, meridian altitude sun; time sight, sun; circum-meridian altitudes; altitude near noon; compass error by time and altitude azimuths; Sumner's method and chart work; chronometer corrections by equal altitude.

Gunnery.—Duties of junior officer of division. The second, third, and fourth classes, with few exceptions, were making their first cruise. As the second and third classes had the benefit of the rigging left on shore, they were instructed in steering, heaving the lead, and signals, while the fourth class were given knotting and splicing. All were taught the lead of all the gear, and the arrangement of the rigging on mast-heads, and yards, making up sails for bending, bending and unbending, furling, loosening, reefing, hoisting, and sending up and down light yards.

In navigation the second class were instructed in dead reckoning, reading the barometer and sextant, and taking an altitude. These classes formed gun's crews, and were duly instructed.

Since the ships have been in the Chesapeake Bay a sheet anchor of this ship has been let go, hove up, and transported to its place in the waist; hawse cleared on board the Dale, and a bower anchor of this ship carried out, besides the boom boats hoisted out on both ships. This working of anchors and chains had not been done for some years.

The conduct of the cadets, has, as a rule, been excellent. They have generally displayed much zeal, and in my opinion, the progress made has been very good. The officers, one and all, were untiring in their devotion to the duties imposed upon them, and I feel very much indebted to them for the good results obtained.

I am, sir, very respectfully, your obedient servant,

N. H. FARQUHAR,
Commander, U. S. N., Commanding U. S. S. Constellation.

Capt. F. M. RAMSAY, U. S. N.,
Superintendent United States Naval Academy, Annapolis, Md.

UNITED STATES PRACTICE-SHIP DALE (3D RATE),
Off Naval Academy, Annapolis, Md., August 31, 1883.

SIR: I have the honor to submit the following report of the summer cruise of this vessel, under my command.

The Dale was put in commission on May 26, at Annapolis, with the following-named officers, 58 naval cadets (24 first class, 10 second class, 14 third class, and 10 fourth class) and 97 men.

Officers.—Commander C. D. Sigsbee, U. S. N., commanding; Lieut. Harry Knox, U. S. N., executive officer; Lieut. Uriel Sebree, U. S. N., navigator and instructor in navigation; Lieut. W. H. Turner, U. S. N., watch officer; Lieut. J. H. Buell, U. S. N., watch officer; Lieut. T. B. Howard, U. S. N., watch officer; Ensign H. C. Gearing, U. S. N., watch officer; Ensign W. F. Fullam, aid to instructor in navigation; Passed Assistant Surgeon W. A. McClurg, U. S. N., aid; Assistant Paymaster E. B. Rogers, U. S. N., aid.

On June 15 Lieutenant Sebree was detached and his place on board, was taken by Lieut. Duncan Kennedy. No other changes of officers were made during the cruise.

We sailed from Annapolis on June 16, and put to sea from Lynn Haven Bay June 25, the intervening time having been spent in working down Chesapeake Bay during day-light, and lying at anchor at night, always within signal distance of the Constellation.

Working gradually to the northward, we cruised inside the Gulf Stream, chiefly between latitudes $39^{\circ} 20'$, and $40^{\circ} 20'$ N., and longitudes 68° and 73° W., experiencing cool, damp, and foggy weather, with two light or moderate gules.

On July 16 we arrived at Portsmouth, N. H.; we remained at anchor in Portsmouth lower harbor until July 21, when we were towed to the navy-yard, where we had a number of minor repairs made. During our visit at the yard we received all possible aid and courtesy from Commodore Wells and the officers of the yard.

On August 1 we sailed from Portsmouth and worked off and on shore until noon of August 3, when we were 20 miles north of Highland light, on Cape Cod. There we took a favorable wind and stood to the southward and eastward, between George's Bank and Nantucket Shoals, until we had arrived in latitude $39^{\circ} 37'$ N., longitude $68^{\circ} 04'$ W., on August 6. From this point we stood to the northward and westward until noon, August 9, being then about 30 miles southwest of Davis Shoal light-ship, off Nantucket. A fresh northeast wind carried us thence to the Capes of the Chesapeake. We arrived at Lynn Haven Bay on August 13, finding the Constellation at anchor there. Since our arrival at Lynn Haven Bay we have kept in company with the Constellation and have followed her movements. We arrived off the Naval Academy at 7 h. 30 m. a. m. on August 28.

A great deal of work has been done on the cruise, both by the officers and by the cadets, in their respective spheres. A wide range of practice has been compassed for the benefit of the cadets, and, as a rule, they have shown commendable zeal in taking advantage of the opportunity afforded them.

The following statement will show to some extent the ground covered by practice and instruction:

EMPLOYMENT OF NAVAL CADETS.

First class: Seamanship, gunnery, drills, &c.—In charge of the deck; making and taking in sail, tacking, wearing, chapeling, box-hauling, missing stays, heaving to, shifting sails, reefing, shaking out reefs. The various other evolutions in port.

Boat duty: Midshipmen of quarter-deck and fore-castle; mates of lower decks,

hold, and hull; captain's aid; navigator's aid; petty officers; keeping a journal, &c.; officers of gangways, divisions, &c.; gun-company, pistol, and small-arm drill; general quarters and fire quarters; day and night, in port and at sea; target-practice at sea; under way, anchoring, and getting under way; mooring and unmooring; clearing hawse; transporting, letting go, and weighing a stream anchor, and carrying out a bower anchor; in general, all the routine and other work pertaining to a cruise under sail, with the usual visits to port.

Second, third, and fourth classes: Seamanship, drills, &c.—Notes on all the standing and running rigging, fore and aft; on all masts, yards, and head booms; on all sails, pin and fife rails; on boats, rudder, and steering gear; on ground-tackle and on signal code, flags, and systems; notes on Myer's signals, with much practice in signaling; exercise at evolutions of ship below and aloft; at guns, in company, in boats, &c.; exercise in boxing the compass, reading lead and log lines, steering, &c.; all duties except cleaning ship. The notes are accompanied by numerous sketches.

First class: Navigation, &c.—Instruction in all kinds of signals used in our service, adjustment and use of the sextant, vertical and horizontal angles, practice in taking bearings of the sun and terrestrial objects with the azimuth compass; compass error by the altitude azimuth; courses and distances by middle latitude sailings; time sight and meridian altitude of the moon; time sight of the sun; meridian altitude and dead reckoning. All time sights were worked with two latitudes for a Sumner line of position; examples of a complete day's work, including a. m. and p. m.; time sights, meridian altitude; dead reckoning; current, courses, and distances. Each member of the class was required to construct Mercator's chart in his book, plot all the Sumner lines, showing how to run them up or back to noon for the ship's position, and find the sun's bearing from each line, checking it by the azimuth tables; latitude by $\phi' \phi''$ method, working with two assumed longitudes for a line of position; Buckner's method; construction of the table; bow, beam, and quarter bearings for the distances of light-houses, &c.; time of high water; time of sunset by the tables and by a time sight; sketch of Cape Henry (from instruction in the principles of sketching headlands given by the commanding officer); notes on piloting (instruction given by the commanding officer); complete notes (with sketches) on all kinds of buoys, beacons, and other artificial aids to navigation.

The "routine" established for the cruise and provided us in a printed pamphlet has worked well aboard the Dale, and I would recommend that it be continued in force on the next practice cruise.

A list of repairs needed on board the vessel to fit her for future sea service has been prepared for your consideration. I also send you a list of those reports classed as serious which have been made against cadets during the cruise, and, in addition, a special report in the cases of Cadet Rumsey, of the third class, and Cadet Craig, of the fourth class.

I take pleasure in calling your attention to the support given me by Lieutenant Knox and the other officers of the vessel, which has been continuous and hearty throughout. Were I to repeat the cruise, I could wish for nothing better than to have the same officers again under my command. A track chart is inclosed herewith.

Very respectfully,

C. D. SIGSBEE,
Commander, Commanding.

Capt. F. M. RAMSAY,
Superintendent of the Naval Academy.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the United States Naval Academy.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year, ending June 30, 1884.
NAVAL ACADEMY.		
For pay of professors and others, viz (appropriated):		
One professor of mathematics and one of chemistry, at \$2,500 each.....	\$5,000 00	
One professor of English studies, history, and law, one professor of physics, and one of Spanish, at \$2,200 each.....	6,600 00	
One assistant professor of English studies, history, and law, four of French, and one of drawing, at \$1,800 each.....	10,800 00	
One sword-master, \$1,500.....	1,500 00	
Two assistant sword-masters, at \$1,000 each.....	2,000 00	
One boxing-master and gymnast, at \$1,200.....	1,200 00	
One assistant librarian, at \$1,400.....	1,400 00	
One secretary of the Naval Academy, at \$1,800.....	1,800 00	
Three clerks to the Superintendent, at \$1,200, \$1,000, and \$800, respectively...	3,000 00	
One clerk to commandant of cadets, at \$1,200.....	1,200 00	
One clerk to pay officer, at \$1,000.....	1,000 00	
One dentist, at \$1,600.....	1,600 00	
One baker, at \$600.....	600 00	
One mechanic in the department of physics and chemistry, at \$730.....	730 00	
One cook, at \$325.50.....	325 50	
One messenger to Superintendent, at \$600.....	600 00	
One armorer, at \$529.50.....	529 50	
One gunner's mate, at \$469.50.....	469 50	
One quarter-gunner, at \$409.50.....	409 50	
One coxswain, at \$469.50.....	469 50	
One seaman in department of seamanship, at \$349.50.....	349 50	
One attendant in the department of astronomy, and one in the department of physics and chemistry, at \$25 per month, each.....	600 00	
Six attendants at recitation rooms, library, store, chapel, and offices, at \$20 per month each.....	1,440 00	
One band-master, at \$528.....	528 00	
Twenty-one first-class musicians, at \$348 each.....	7,308 00	
Seven second-class musicians, at \$300 each.....	2,100 00	
	53,559 00	
*Additional pay to third clerk to Superintendent, at \$200 (submitted).....	200 00	
†One mess-man, at \$288 (submitted).....	288 00	
‡Additional pay for mechanic in department of physics and chemistry, so that he may receive \$3.50 per day (submitted).....	365 50	
§Additional pay to six attendants at recitation rooms, library, store, chapel, and offices, at \$5 per month each (submitted).....	360 00	
||One messenger to commandant of cadets, at \$300 (submitted).....	300 00	
	1,513 50	
	55,072 50	\$53,559 00
For pay of watchmen and others, viz (appropriated):		
One captain of the watch and weigher, at \$2.50 per day.....	912 50	
Four watchmen, at \$2 per day each.....	2,920 00	
One foreman of the gas and steam-heating works of the Academy, at \$5 per day.....	1,825 00	
Ten attendants at gas and steam-heating works: one at \$3, one at \$2.50, and eight at \$2 per day each.....	7,847 50	
One steam-pipe fitter, at \$600.....	600 00	
One foreman of joiners, one foreman of painters, and one foreman of masons, at \$3.50 per day each.....	3,286 50	
One mason, at \$3 per day.....	939 00	
Two joiners and one painter, at \$2.50 per day each.....	2,347 50	
One tinner, one gas-fitter, and one blacksmith, at \$2.50 per day each...	2,347 50	
	23,025 50	23,062 50

*The duties performed by the third clerk to the Superintendent require a responsible and competent person; the labor performed is fully worth \$1,000 per annum.

†A mess-man has been allowed for twenty-eight years. It was omitted from the last appropriation act through a misunderstanding.

‡This position requires a skilled mechanic and instrument-maker.

§These attendants must be trustworthy persons, and they should receive more pay than ordinary scrubbers and cleaners.

||A messenger is a necessity to the officer filling the position of commandant of cadets.

Estimates of appropriations required, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year, ending June 30, 1884.
NAVAL ACADEMY—Continued.		
For pay of mechanics and others, viz (appropriated):		
One mechanic at workshop, at \$2.25 per day	\$704 25	
One master laborer to keep public grounds in order, at \$2.28 per day	832 20	
Fourteen laborers to assist in same; three at \$2 per day each, and eleven at \$1.50 per day each	7,510 50	
One laborer to superintend quarters of cadets, at \$2 per day	730 00	
Twenty servants to attend and keep in order quarters of cadets and public buildings, at \$20 per month each	4,800 00	
	14,576 95	\$14,590 23
For pay of the employes in the department of steam engineering, viz (appropriated):		
One master machinist, one boiler-maker, and one pattern-maker, at \$3.50 per day each	3,286 50	
Two machinists and one blacksmith, at \$2.50 per day each	2,347 50	
Four laborers, at \$1.50 per day each	2,034 00	
	7,668 00	
*One molder, at \$2.50 per day (submitted)	782 50	
	8,450 50	7,671 00
For necessary repairs of public buildings, pavements, wharves, and walls inclosing the grounds of the Naval Academy, and for improvements, repairs, and furniture and fixtures	21,000 00	21,000 00
For fuel for heating and lighting the Academy and school-ships	17,000 00	17,000 00
For contingent expenses, Naval Academy:		
For purchase of books for the library	2,000 00	2,000 00
For stationery, blank-books, models, maps, and for text-books for use of instructors	2,000 00	2,000 00
For expenses of Board of Visitors to the Naval Academy	1,500 00	1,500 00
†Additional for expenses of Board of Visitors to the Naval Academy (submitted)	1,100 00	
For purchase of chemicals, apparatus, and instruments in the department of physics and chemistry, and for repairs of the same	2,500 00	2,500 00
For purchase of gas and steam machinery, steam-pipe and fittings, rent of buildings for use of the Academy, freight, cartage, water, music, musical and astronomical instruments, uniforms for the bandsmen, telegraphing, and for feed and maintenance of teams, and for the current expenses and repairs of all kinds, and for incidental labor and expenses not applicable to any other appropriation	34,600 00	34,600 00
For stores in the department of steam engineering	800 00	800 00
For materials for repairs in steam machinery	1,000 00	1,000 00
RECAPITULATION.		
For pay of professors and others	\$55,072 50	\$53,559 00
For pay of watchmen and others	23,025 50	23,062 50
For pay of mechanics and others	14,576 95	14,590 23
For pay of employes in the department of steam engineering	8,450 50	7,671 00
For necessary repairs to public buildings, &c.	21,000 00	21,000 00
For fuel for heating and lighting	17,000 00	17,000 00
For purchase of books for the library (contingent)	2,000 00	2,000 00
For stationery, text-books for instructors, &c. (contingent)	2,000 00	2,000 00
For expenses of Board of Visitors (contingent)	2,600 00	1,500 00
For purchase of chemicals, &c., department of physics (contingent)	2,500 00	2,500 00
For purchase of gas and steam machinery, &c. (contingent)	34,600 00	34,600 00
For stores in department of steam engineering (contingent)	800 00	800 00
For materials for repairs in steam machinery (contingent)	1,000 00	1,000 00
Total	184,625 45	181,282 73

*A molder has been allowed for 16 years, except the present year. The services of a molder are necessary.

†The average yearly expenses of the Board of Visitors for eight years has been \$2,520.89. The expense for the year 1883 was \$2,591.75. Of this amount \$1,317.84 was required for traveling expenses of ten members of the Board. Two members of the Board were not present and drew no travel.

Respectfully submitted.

F. M. RAMSAY,
Captain, United States Navy, Superintendent.

REPORT OF BOARD OF VISITORS.

UNITED STATES NAVAL ACADEMY,
Annapolis, Md., June 9, 1883.

SIR: The Board of Visitors selected to attend the annual examinations at the United States Naval Academy submit the following report of their proceedings:

The Board met on Saturday, June 2, and organized by the appointment of Rear-Admiral John C. Howell, United States Navy, as president, and Senator E. G. Lapham, of New York, as vice-president.

The following standing committees were appointed:

Grounds, buildings, and sanitary condition.—Hon. E. G. Lapham, Hon. R. Q. Mills, Hon. A. C. Harmer, Hon. T. Updegraff, and Dr. S. A. Green.

Seamanship, ordnance, and navigation.—Hon. A. G. McCook, Hon. A. C. Harmer, and Rear-Admiral John C. Howell.

Discipline, drill, practical exercises, administration, and police.—Maj. Gen. Irvin McDowell, Hon. R. Q. Mills, and Rev. J. W. Dinsmore.

Steam, mathematics, physics, and mechanics.—Hon. J. N. Camden, Prof. G. I. Riché, and Dr. S. A. Green.

English studies, modern languages, and drawing.—Prof. G. I. Riché, Mr. E. V. Kinsley, and Rev. J. W. Dinsmore.

Finance and library.—Hon. A. G. McCook, Hon. T. Updegraff, and Mr. E. V. Kinsley.

Final report and to select orator to address the cadets on Saturday, June 9.—Hon. E. G. Lapham, General Irvin McDowell, and Dr. S. A. Green.

Standard of scholarship.—Dr. S. A. Green, Mr. E. V. Kinsley, Prof. G. I. Riché, and Rev. J. W. Dinsmore.

The Board met daily for the consideration of subjects before them.

GROUND, BUILDINGS, AND SANITARY CONDITION.

The buildings were all examined, and we take pleasure in stating that we found everything has been done during the year which was feasible to render the premises healthy and comfortable. The condition of the buildings was cleanly and orderly. Trees have been planted, the grounds have been graded and turfed, roads and pavements made, and they have a very attractive appearance.

The Superintendent's quarters, which were in a dilapidated condition, as stated in the report of the Board last year, have been taken down and a new and substantial building of brick erected on the same site, with the walls and slate and tin roofs completed.

A substantial bridge has been built across College Creek on the road leading to the Naval Cemetery, the farm, and the Naval Hospital. Many desirable improvements have been made on that portion of the Government's grounds. The orchards have been trimmed, the underbrush cleared away, the cemetery enlarged, the verandas on the wing walls of the hospital taken down, and the roof repaired so as to protect the building from further decay.

Without giving minute particulars, we may add that in our judgment there has been a judicious, economical, and necessary expenditure in all these repairs and improvements made during the year.

We beg to renew in substance the recommendations made by the Board of Visitors last year:

First. That the new quarters for the Superintendent should be completed at the earliest practicable period.

Second. That quarters for all the cadets should be erected, in a plain building of modern style, on the northeast portion of the grounds now occupied by old and inconvenient buildings, numbered from one to nine, inclusive; so that the cadets shall live under one roof, instead of being widely separated as at present. That a mess-room and kitchen should also be erected in the same section, separate from the cadets' quarters. This change can be made by using much of the material in the old buildings, and without requiring a very large appropriation of money in any one year.

The building at the western end of the grounds, where the larger portion of the cadets are at present quartered, and in which are the kitchen and mess-room, could then be converted into residences or apartments for those of the professors and officers who now reside outside the Academy limits (some ten or twelve in number). This, as well as the separation of the kitchen and mess-room from the cadets' quarters, we deem very important changes.

We also recommend the purchase of so much of the ground as lies between the west wall of the Academy limits and the gas-works of the city of Annapolis, and the extension of the limits to the line of such purchase. This will bring into possession of the Government a part of the city where epidemic diseases are most likely to prevail, and will remove a very unhealthy district from contiguity to the present grounds and afford an almost direct passage by Hanover street to the bridge leading to the cemetery, farm, and Naval Hospital. The tract is about three by four hundred feet in size, and its assessed value about \$11,000.

We also recommend that the hospital and outbuildings connected therewith be repaired and put in order to be ready for use as a naval hospital. It is capable of accommodating a very large number of patients, is upon an elevated and healthy site, and was constructed at a large expense to the Government. It should no longer be suffered to run to decay.

STEAMSHIP, ORDNANCE, AND NAVIGATION.

The Board witnessed the practical exercises in steamship and gunnery on board the U. S. S. Wyoming, while under way. The cadets got up steam, fired, worked the engines, made sail, reefed and furled most creditably, and the exercises at general quarters and target practice were worthy of high praise. More attention has been given to practical navigation than heretofore; and in seamanship the cadets commence at the lowest round of the ladder, and literally dip their hands in the tar-bucket, learn practically to knot and splice both hemp and wire rope, strop blocks, and so to the highest branches of the practical sailor's handicraft.

DISCIPLINE, DRILL, PRACTICAL EXERCISES, ADMINISTRATION, AND POLICE.

Every facility has been given by the authorities in the inquiries made concerning the discipline and administration of the Academy.

In accordance with the request of the Secretary of the Navy, information was sought, not only from the officers of the Academy, but from the cadets as well; and after seeing those who came forward voluntarily in response to an invitation published to the whole corps, several cadets were especially sent for and examined concerning the state of discipline

at the Academy and the effect of the various reforms made by the present Superintendent.

One of these reforms was a radical one, affecting the whole system of discipline; and the others were important and bore directly upon it.

The most important one, and one especially distasteful to the cadets at first, was the change made in the manner of placing them in their quarters.

Formerly each class lived by itself. Cadets of the first class had special privileges as a class, and the impression seems to have prevailed that the action of class on class, and especially of the first class on the others, was beneficial to discipline, even more so than that produced by military organization of various grades, acting from the impulse given from the commander.

The change consisted in quartering the cadets by divisions (companies), each composed of all the classes; the cadet officers and cadet petty officers with it on the same floor. The discipline to be maintained, as far as possible, by the same means as are in use in the Navy.

Another reform, and one that bears directly upon discipline, was the abolition of privileges to members of a class as such, and the giving of privileges in each class according to the standing of the cadets therein in conduct and studies.

These changes, and other minor ones concurring, were not made without friction; and the serious change in the future of the great majority of the corps by the recent act of Congress, which provides for only a small portion of each class to be, hereafter, received into the naval service, has tended to disturb the minds of the cadets, and a restless feeling seems to have existed, which prepared them for those exhibitions of temporary insubordination which occurred in the early part of the year.

As to the changes recently made at the Academy, those coming to our notice, and especially the two before mentioned, are, we submit, in the right direction; and when they shall have been maintained long enough to pass through the transition period—which is ever one of some disturbance—the effects will be beneficial to the service.

In no instance have we found any one to complain of the discipline as oppressive, though some have thought it too lax.

The course of the Superintendent seems to us to have been characterized by a sense of justice, and by untiring efforts, in every direction, to promote the interests and improve the character of the Academy.

While bearing witness to the zeal and fidelity of all the authorities connected with the Academy, there are two changes in the maintenance of discipline which, we submit, the interests of the service require:

(1.) By the Regulations of the Naval Academy of January 1, 1876, paragraph 169, cadets were declared liable to be tried by court-martial.

But an opinion was given by the Attorney-General, July 10, 1877, to the effect that, while the cadet at West Point was "liable to court-martial," the cadet at Annapolis was not so liable except for the offense known as "hazing"; and since then no courts, save for this offense, have been instituted for the trial of cadets at the Naval Academy, and punishments for offenses committed have been given by the order of the Superintendent or that of the Secretary of the Navy. To assist him in determining the guilt of an accused, the Superintendent has convened Boards of officers, and has taken his action on, or after, their report. These Boards have neither the power nor character of courts. They keep no record of their investigations, but merely report their findings and opinion.

Section 1624 Revised Statutes says: "The Navy of the United States shall be governed by the following articles" (the Articles of War of the Navy, "providing for courts-martial and courts of inquiry for the trial of military offenses").

The ruling of the Department of Justice to the effect that naval cadets are not subject to these articles, and consequently not in the Navy, will be a surprise to many persons who thought that the naval cadet belongs to and forms part of the Navy, and, equally with the Army cadet, has all the rights and safeguards which the military law provides for the administration of discipline.

The offense of "hazing," which, owing to an act of Congress, is alone, according to the opinion of the Attorney-General, triable by court-martial, while a gross and sometimes a brutal one, is by no means of the same gravity as offenses to be punished by the order of the Superintendent, or that of the Secretary of the Navy.

And if it be necessary—and Congress declares it is—that before condemning a cadet for "hazing" a trial shall be had before a competent court, it is certainly so, we submit, for such acts as not only unfit the accused for honorable life in the Navy, but blast his character as a man and a citizen.

Falsehood, fraud, slander, and obscenity are offenses for which the naval cadet can be, now, dismissed by the Secretary of the Navy without trial.

(2.) The other change is one within the power of the Navy Department to make, if, indeed, in many cases it is not within that of the Superintendent of the Academy.

This change is, that in any question of an alleged offense against the regulations, the cadet shall not be called on to criminate or exculpate himself, but his guilt or innocence shall be determined by others, or by his own voluntary admission; and where an offense is supposed to be committed, it shall not be fastened on any one by calling up all who may be supposed to have committed it, and requiring them to certify on honor they are not guilty, and thus, by elimination, detect those who are so!

We witnessed the exercises of the cadets at infantry and artillery drill, dress parade, gymnastics, in the steam-engine room, and on board ship as seamen and artillerists, and in all found their skill and knowledge entirely satisfactory.

The administration and police is all that can be desired.

We recommend that the act of August, 1882, be amended as a similar act in relation to cadets at West Point has been, so as not to include those cadets who had entered the service before the passage of said act.

ENGLISH STUDIES, MODERN LANGUAGES, DRAWING, STEAM, MATHEMATICS, PHYSICS AND MECHANICS.

After as careful an investigation as we could make in the absence of oral examinations in all departments except that of modern languages, we are entirely satisfied with the manner in which the studies are arranged and conducted.

We conferred with many of the professors and heads of department, and feel convinced that, in view of the nature and scope of the school, the course is compact, thorough, and adapted to its end.

We feel called on to propose no change other than that embodied in this report on the standard of scholarship, and desire to bestow the heartiest commendation on all that we have seen.

FINANCE AND LIBRARY.

The Board commend the economical administration of the financial affairs of the Academy, and approve the present system of purchasing supplies, by which a large annual saving is made.

The library was found to be in most excellent condition. It now consists of about 22,000 volumes of professional, scientific, and historical works, and the average yearly increase is about 700 volumes.

We recommend that the usual annual appropriation for the purchase of books be continued.

STANDARD OF SCHOLARSHIP.

We have considered with some care the question of scholarship in the Academy, and it is the unanimous opinion of the members of the Board that the standard is not too high. We find that the heads of department have been faithful and conscientious in their work, and the results satisfactory.

We recommend that the choice of the branch of service to be entered be made by each cadet, subject to the decision of the Academic Board, at the end of the third year, instead of the sixth, as provided for by the present law.

We also recommend that the fourth year be devoted to technical studies adapted to their special courses, and that at the end of the fourth year those for whom there are no vacancies shall receive the customary diploma and be discharged from the service.

In conclusion, we commend the Naval Academy to your favorable consideration, and we solicit for it the liberal support of the Congress of the United States.

Very respectfully, your obedient servants,

J. C. HOWELL,
Rear-Admiral.
E. G. LAPHAM,
United States Senate.
SAMUEL A. GREEN,
Massachusetts.
GEO. I. RICHIE,
Pennsylvania.
EDWARD V. KINSLEY,
New York.
JOHN W. DINSMORE,
Illinois.
THOMAS UPDEGRAFF,
Iowa.
ANSON G. MCCOOK,
New York.
IRVIN McDOWELL,
Major-General, U. S. A.
R. Q. MILLS,
Texas.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy.

No. 19.—REPORT OF THE ADMIRAL.

WASHINGTON, D. C., *November 19, 1883.*

SIR: In compliance with your order, I beg leave to submit the following report.

During the past summer I visited the torpedo station at Newport, R. I., and among other matters of interest noticed a new contact torpedo, the best of the kind I have seen. It not only explodes by contact, but it can be fired by electricity, by closing the circuit on contact, which renders an explosion absolutely certain. The whole arrangement is admirable of its kind, and for boat-torpedoes leaves little to be desired.

Unfortunately our steam-launches supplied to vessels of war are not at all suited for torpedo-boats, not having speed or capacity for carrying with effect a properly constructed torpedo. We have adopted rather a heavy form of launch that may do very well in smooth water or against vessels at anchor, but will never be able to operate successfully against vessels in motion, and will be liable to swamp in anything like a seaway.

There are two steam-launches in Newport, one attached to the New Hampshire and the other to the torpedo station. The New Hampshire's launch has been in constant use for upwards of a year, and is in every respect suitable for naval purposes. Why could we not have a boat of similar character for the general service, instead of the present heavy, clumsy, and unseaworthy launches that continue to be built for the Navy?

The Board of Inspection and Survey last summer examined a number of pulling-boats, among them the French barge, the two Selfridge boats now in the training squadron, and others, with a view to the reorganization of our boat system. To render the examination more complete, I beg leave to suggest that the Board of Inspection be directed to institute a competitive trial between the New Hampshire's Herreshoff boat and the steam-launch at the torpedo station and any regular Navy steam-launch that may be selected by the Department; the trial to be made in Newport Harbor, and one of its conditions to be the testing of the sea-going qualities of the boats.

To show that the Herreshoff launches have received the favorable indorsement of the Engineer Corps in all that relates to their steam generators and engines, I quote herewith a report to the Bureau of Steam Engineering which gives full information on the subject:

NEW YORK NAVY-YARD, *October 26, 1880.*

SIR: In compliance with the Bureau's telegram of the 21st instant to forward a preliminary report in general terms of the results of the competitive experiments made at Bristol, R. I., by the Board of Chief Engineers of the Navy, convened for that purpose by the order of the Navy Department dated June 4, 1880, on a Navy steam-launch and on two Herreshoff steam-launches, we have the honor to submit the following:

All three steam-launches were of wood and had nearly the same dimensions. The Navy launch was coppered; the other two were uncoppered, but smoothly painted.

The Herreshoff launches were duplicates in all respects except engine, one of them

being fitted with compound and the other with simple engines of equivalent power, but the boilers and screws of both were identical. The engines of both Herreshoff launches had the cylinders connected at right angles; they were condensing engines fitted with surface condensers, and the combustion in the boilers was by natural draught. The engine of the Navy launch consisted of a single non-condensing cylinder, and the combustion in the boiler was by the blast of the exhaust steam delivered into the chimney.

The extreme length of the Herreshoff launches was 33 feet 1 inch; extreme breadth, 8 feet 9 inches; mean draught of water to rabbet of keel with everything ready for steaming, full bunkers, and seven persons on board, 1 foot 7 inches; displacement of sea-water at this draught, 8,929 pounds. The weight of the launch, including machinery for storage on board ship, was 6,555 pounds.

The Navy launch was 33 feet 8½ inches in extreme length, 8 feet 7 inches in extreme breadth; mean draught of water to rabbet of keel, with everything on board ready for steaming, full bunkers, and four persons, 2 feet 2 inches. Displacement of sea-water at this draft, 16,682 pounds. The weight of the launch, including machinery for stowage on board ship, was 13,364 pounds.

The simple engines of one of the Herreshoff launches had two cylinders of 4½ inches diameter, and 7 inches stroke of piston. The compound engine of the other Herreshoff launch had two cylinders of 4½ and 7 inches diameter, with 7 inches stroke of piston.

The boilers of both launches were of the patent Herreshoff coil type, with 6 square feet of grate surface. The screws were of brass, four-bladed, 31.3 inches in diameter, 4.6 inches in length, and 44 inches in pitch.

The cylinder of the Navy launch was 8 inches in diameter, and 8 inches in stroke of piston. The boiler was of the cylindrical return-tube type, and contained 6.5 square feet of grate surface. The screw was four bladed, 35 inches in diameter, and 54 inches in pitch.

With the launches and machinery above described there were made numerous series of experiments as exhaustively as practicable. The vessels were tried over a measured base at speeds varying from 5 to 11 statute miles per hour, increasing in regular progression by half a mile at a time, and in both smooth and rough water. The machinery was thoroughly tried, both with the vessels in free route and secured to the dock, with every possible variation of boiler pressure from 10 pounds to 100 pounds per square inch above the atmosphere, increasing by 5 pounds at a time, with every possible variation of piston speed, preserving the same piston pressures obtained by first depressing the stems with weights and then raising them by means of a floating derrick, with every possible measure of expansion for the steam of the different boiler pressures and with the different speeds of piston, and, finally, by disconnecting the high-pressure cylinder of the compound engine and operating the low-pressure cylinder alone, experimenting with the same ranges of boiler pressure, measures of expansion, and piston speeds as before. In brief, the experiments were made to cover every possible variation of speed of vessel, boiler pressure, measure of expansion for the steam, and speed of piston, and for both the simple and the compound engine. Lastly, an extensive series of experiments were made on superheated steam under the conditions of different steam pressures, speeds of piston, and measures of expansion.

Each of the series embraced a large number of experiments, the whole occupying about ten weeks of uninterrupted work during June, July, and August, 1880, from 5 o'clock in the morning until 8 and 9 o'clock in the evening, during which about 24,000 indicator diagrams were taken.

From the indicator diagrams, a set of which was taken every fifteen minutes during the long dock trials, and as often as the paper could be changed on the instruments for the trials in free route over the measured base, the power developed in each case can be exactly ascertained.

The coal (anthracite) consumed was all carefully weighed, as well as the refuse from it in ash, clinker, dust, and soot. The feed-water pumped into the boiler was also accurately measured, so that in each experiment not only the power exerted, but the cost of that power in weight of crude coal, of its combustible portion, and of the weight of feed-water or steam consumed, can be known. In fact, the data taken were complete in all respects, leaving nothing to be desired in this particular.

Until the indicator diagrams are computed, the data reduced, and the results generalized, no exact facts can be given, but the following general opinions, arrived at by close observation during these long and exhaustive experiments, can be depended on with every confidence that they will be confirmed when our report is made in extenso.

1st. *As regards the hulls of the launches.*—The models of the Herreshoff launches and the distribution of their weights have been so perfected by long and intelligent experience and experimenting as to scarcely leave room for improvement—the Herreshoff Manufacturing Company having for many years made a specialty of designing,

constructing, and testing steam-launches, steam-yachts, steam torpedoboats, and similar vessels. The material is of the best quality, well seasoned, and carefully selected. It is so distributed in the construction of the hulls that the required strength is obtained with the least weight; the thoroughness and perfection of the fastenings being depended on, instead of masses of material poorly secured. The workmanship cannot be excelled in neatness, finish, and skill. These hulls combine the maximum of strength with the minimum of weight, which is the end to be attained in this class of vessels where lightness is of the first consequence for stowage on board ship, carrying capacity, small draught of water, and speed. In all these particulars of model, construction, combination, strength, finish, lightness, quality of materials, and workmanship, the Herreshoff steam-launches are incomparably superior to the Navy launches, a superiority resulting from the fact that the latter are only occasionally designed and built at the navy-yards, and then by persons whose skill and experience lie in the designing and constructing of large vessels, and who devote little or no attention to what is considered as comparatively a small matter, but which, if the highest excellence is to be attained, requires much special training and experience.

2d. *As regards machinery.*—The system of machinery employed in the Herreshoff launches is quite original in most of its details. It is diametrically opposite to that which is used in the Navy launches, and is in every particular greatly superior to the latter.

In the Navy launches a single cylinder is employed, and the starting and stopping are consequently uncertain and slow, with the risk of damage and accident from running into wharves and vessels, and also loss of time.

In the Herreshoff launches two cylinders are employed connected at right angles, with the resulting quick and certain starting and stopping, saving of time, and freedom from risk of accident by collision.

In the Navy launches, steam of high pressure, 80 to 100 pounds per square inch above the atmosphere) is used almost without expansion, and it is generated in a type of boiler whose strength is only moderately in excess of the pressure. This steam is not condensed, but is exhausted direct into the chimney of the boiler to cause sufficient draught for generating the disproportionally large quantity of steam required with this system.

In the Navy launches the steam is thus used with the least possible economy, being worked almost without expansion against a considerably higher back pressure than the atmosphere, owing to the resistance of the blast; hence, for a given power, more machinery is required, with its increased money cost and weight and bulk to carry, than if the steam were used more economically; or, for a given weight and bulk of machinery, less power is developed and consequently less speed of vessel is obtained. If more machinery be placed in the vessel to increase the speed, the greater immersion given to the hull by the greater weight acts of itself to diminish the speed, while the greater bulk diminishes the space for the persons or things to be carried.

The use of high-pressure steam causes more heat radiation from the boiler and engine, which is very objectionable in the small spaces of a launch; the quantity of coal consumed in a given time being greater, the fireman's labor is proportionally greater; while the blast in the chimney is not only annoying to the persons embarked, by sending sparks, ash, and dirty water over them, but the noise it makes, besides being very disagreeable, is so loud as to be heard for several miles, giving an enemy timely notice of approach, and almost wholly unfitting these launches for any military purpose where secrecy and surprise are essential. As the steam is not condensed, and as the boiler cannot use sea water, tanks of fresh water have to be carried for feeding it.

The vessel's load is thus increased by the weight of water and tanks carried, deepening her draught of water and correspondingly lessening her speed, besides occupying space to the exclusion of persons or things to be carried. In fact, the consecutive use of the launch is limited to the time for which the tanks will supply the boiler with water, and at the maximum speed of the vessel they contain but a few hours' supply. The military value of the launches, therefore, in expedition, towing boats, carrying dispatches, &c., is very limited; and any system that would increase their efficiency in this respect should be promptly adopted.

In the Herreshoff launches the engines are by preference of the compound type and of the simplest design; the two cylinders are connected at right angles, and the control of the vessel is thus made complete, there being no time lost and no uncertainty in the starting, stopping, and backing.

There are no independent cut-off valves, the difference in the areas of the piston of the two cylinders giving, without that complication, an expansion of from four to five times, so that all the economy possible from this source is attained. The boiler is practically inexplodable, being composed of a coil of iron pipe from 2 to 3 inches in outside diameter, according to size of boiler. The steam pressure carried, however, is comparatively low, ranging for ordinary use from 40 to 60 pounds per square inch above the atmosphere, the engines being made strong enough to run under a pressure of 150 pounds, or as much as the boiler can be made to furnish.

This boiler has a forced circulation, is absolutely safe, both on account of its strength and of the very small quantity of steam and water which it contains; it is operated by natural draught, which, however, can be increased by a small steam jet thrown into the chimney whenever there may be a demand for the maximum quantity of steam. The economic vaporization is as good as that of any other marine boiler. This boiler, owing to its forced circulation, with the feed-water entering at the top of the coil, while the steam is drawn off at the bottom, can be successfully employed with the highest rate of combustion given by a powerful fan blast delivering the air into a closed ash-pit; that is to say, with a combustion of 50 pounds of coal and over per square foot of grate surface per hour, being in this respect the only boiler composed exclusively of tubes that can be worked at exceptionally high rates of combustion.

In all other boilers of this kind the rate of combustion is limited by the fact that as soon as the quantity of heat thrown in a given time on the tubes reaches a very moderate amount, the water is driven from the iron, which, deprived of that protection, speedily burns out.

The coil boiler is the lightest ever constructed for its power, and the weight of water contained in it is the least. This boiler is the peculiar feature of the Herreshoff system, and the only part patented.

The engine is condensing, the steam from the cylinder being exhausted into a surface condenser of the simplest design and lightest execution, formed by a copper pipe secured to the outside of the hull just above the keel. By this means the boiler is supplied with fresh water, and the slight quantity lost by leakage is restored from a small tank situated beneath the boiler.

The continuous service of the launch is thus limited by only the weight of coal it can carry, and not by the weight of the water it can carry.

The bunkers can be easily and quickly refilled from other vessels at any locality, but the filling of tanks with fresh water can only be done where fresh water can be obtained.

The use of condensing engines with surface condensers renders the Herreshoff steam-launch of real military value from the length of time it can continuously steam, and from its freedom from noise. There is no puffing and screaming of the steam exhausted into the chimney, after the manner of a locomotive, nor is there any noise from steam blown off at the safety-valve when the engines are stopped temporarily, as the steam is then blown from the boiler directly into the condenser, and there condensed; the condenser, under these circumstances, cannot be overheated, as the outboard pipe is in continual contact with continuously changing outside water, even when the vessel is at rest.

The Navy launch carries 960 pounds of coal in the bunkers and 2,500 pounds of water in the tanks, and in smooth water can maintain a speed of 7 statute miles for four consecutive hours, after which the tanks must be refilled.

The Herreshoff launch carries 1,120 pounds of coal in the bunkers, and can maintain a speed of 7 statute miles for twenty-eight consecutive hours, after which the bunkers must be refilled.

But if there be added to the fuel weight the 2,500 pounds in water in the Navy launch, then, the consecutive steaming of the Herreshoff launch can be extended to ninety-eight hours.

The maximum speed of the Navy launch was 8.5 statute miles per hour, and of the Herreshoff launch 11 statute miles per hour.

When the two launches were tried together in very rough water, against a strong head wind and sea, the superiority of the Herreshoff launch was much more marked than in smooth water. While the Navy launch took in so much water over the bows as to endanger her safety, and to require constant bailing with buckets, the Herreshoff launch was dry. She was much better trimmed, lighter, more buoyant, and every way superior in nautical qualities to the Navy launch, at the same time making double the speed.

As regards economy of fuel, the Herreshoff launch develops the indicated horsepower with less than half the coal required in the Navy launch.

In every particular the superiority of the Herreshoff launches to the Navy launch was so marked as to be apparent to the most cursory observation. Their weight was one-half, and their economy of fuel was double; their nautical qualities were much finer; their carrying capacity was greater; their finish and general arrangement were better; they were noiseless, and their capability of continuous service was enormously greater. The superior adaptability of the Herreshoff system to that of any other known to us for steam launches, steam yachts, steam pinnaces, torpedo-boats, small gun-boats, &c., is so unquestionable that, after the most extensive experiments and thorough examination of the subject, we are constrained to recommend it, though comparatively new, to the serious attention of the Department for such classes of vessels. The management of the boiler differs from the management of boilers of other types, but is soon acquired by the humblest intelligence, and we believe the engineer-

ing of the Navy should be familiarized with it as speedily as possible, as its use is certain to extend as its merit becomes understood.

Very respectfully, your obedient servants,

B. F. ISHERWOOD,
Chief Engineer.

THEO. ZELLER,
Chief Engineer.

JOHN B. CARPENTER,
Chief Engineer.

Engineer-in-Chief WILLIAM H. SHOCK, U. S. N.,
Chief of the Bureau of Steam Engineering, Navy Department.

The Coasters' Harbor Island station for training naval apprentices has not a cheerful aspect, though its dismal appearance was doubtless heightened by the rainy weather in which I saw it. The place has no appearance of a naval station, aside from the flag-staff that stands on an eminence, nor will it ever realize the reasonable expectations of the service, while its most prominent feature is the pauper establishment, which prevents the Government from using the buildings, which could be made serviceable to the Navy in many ways.

It seems to me inconsistent with the character of a naval station to have the public buildings filled with paupers, and the necessary work of the station is more or less hampered by the presence of an element which has nothing in common with the Navy.

I will mention one way in particular to which the buildings might be applied. Owing to the paucity of ships in the Navy, the Department is at a loss how to employ its officers, and I would recommend that the buildings referred to at Coasters' Harbor Island be used for the purpose of establishing a post-graduate school for officers, who should be afforded every opportunity to perfect themselves in the higher branches of education, and acquire a more practical knowledge of what they have been theoretically taught at the Naval Academy. There should be a well-digested plan of instruction, including a thorough knowledge of the steam engine, iron shipbuilding, and gunnery in all its branches.

This plan would involve comparatively little expense; the instructors could be found in the Navy, the buildings are already ample for a school of forty or fifty pupils, and officers could at the same time derive all the advantages to be gained from the torpedo station. Such an institution would be very popular in the service.

My own experience tells me that young men graduating from the Naval Academy, no matter how high their standing, have but a superficial knowledge of much that has been crammed into them, and would very willingly, after a course at sea, attend a school of instruction where they could make themselves thoroughly acquainted with all that in these days of progress it becomes a naval officer to know.

The Navy should keep up with the times. If this post-graduate system had been adopted ten years ago our officers would not now be involved in perplexities in regard to building ships and making guns, the experience of the naval powers of Europe would be familiar to them, and there would be no difficulty in obtaining a sufficient number of officers for any duty where scientific attainments and practical knowledge are necessary.

To show how this matter is viewed by the Army authorities, I will instance the school at Fortress Monroe, where officers are sent as soon as possible after graduation from West Point.

Any one can see the advantage such a school of instruction would be to the Navy. Much, of course, would depend on the manner in which

the post-graduate course was inaugurated, the character of the commanding officer, and of the instructors appointed to assist him.

As the torpedo school has been established with such great advantage to the service, there would appear to be no reason why Coasters' Harbor Island should not supply another pressing want to the Navy besides serving as a training station and drill ground for the naval apprentices. While the paupers remain in the buildings they must necessarily wear out the premises, as no money is expended for repairs, and their cattle occupy a large portion of the grounds.

It seems to me that the State of Rhode Island has had sufficient time to provide for the indigent people elsewhere, and that further delay will interfere greatly with the advancement of the training school.

I have read in the newspapers certain reports in relation to the new steel-armored vessels designed for the Navy by the Advisory Board, and, although such publications may not be considered "official," I think I am warranted in considering them as expositions of the opinions of the Board, and therefore beg leave to make a few remarks on the subject. I am anxious that the Board should succeed in this the first attempt to rebuild our decaying Navy, and do not write in anything like a fault-finding spirit, but I take a practical view of the case, in which I think I am justified by my long experience.

The proposed vessels are intended as cruisers in time of war and in time of peace. A few years ago the powers of Europe, including even the Ottoman Government, consulted together with a view of abolishing privateering, and of establishing what should be considered contraband of war. Among other things, it was decided that all kinds of coal should be so considered. In case of our having a war with any foreign power all the coaling stations of the world would be closed against us; hence the necessity that we should build vessels having full sail and steam power, so that they could make good speed cruising under sail, with fires banked ready at a moment's notice to get up steam.

Take the Chicago for example. It is said she will have only 14,000 square feet of canvas in her principal sails. Any seaman knows that so small an amount of canvas can only be considered "auxiliary," and would only propel the vessel through the water in a very fresh breeze. With the very peculiar rig of the Chicago, without bowsprit and jibs projecting beyond the bow, no vessel would work under sail in smooth water, much less in a heavy sea.

Wilson, in his treatise on shipbuilding, says—and he is supported by numerous authorities—

The capacity which a ship possesses for being maneuvered depends on the proportionate areas and moments of the head and after sails, and on the position of the two separate centers of effort of those two sets of sail. What the power of maneuvering by sail must principally depend upon is the horizontal distance between the separate centers of effort of the head sail and after sail, for that distance is the lever at the two ends of which those two sets of sails act in turning the vessel.

Both jibs and spanker are necessary in maneuvering a ship, especially a long one; the after sail in checking the tendency of a ship to lose her headway, and the head sail to get her round and pay her off when having passed the direction of wind ahead.

To show the importance of the head sails in a ship of the Brooklyn type, having a length of about 250 feet, the area of her jibs and fore staysail includes about 3,080 square feet, being 780 square feet more than the area of the foresail. The whole amount of sail in this comparatively small ship is nearly 22,000 feet.

It may be argued that the proposed ships will not be required to ma-

never, and that they will always work in important cases under steam; but in war it is necessary to guard against every contingency, and even in time of peace every effort should be made to economize coal, the careless expenditure of which eats up the public treasure. What a steamship consumes in coal would in a few years buy a new vessel.

There is no reason why a cruising ship of war should not be full power in sails and masts. In the days anterior to steam, when ships had to depend entirely on their sails, the masts and rigging had to be made very heavy to enable a vessel to carry sail in gales of wind, claw off a lee shore, chase an enemy in all weather, or escape from one. Now all that is changed. War vessels can work under steam in case of necessity; the ponderous masts are no longer necessary; masts and yards can be made of steel, reducing their diameter one-third, and with the many appliances for hoisting and lowering, a ship of war, if well disciplined, can be reduced to her lower masts in a very few moments. The same area of sail, compared to immersed midship section, can be carried now with less trouble than before, and is necessary to make an efficient cruising vessel of war.

When steam was first introduced into the Navy it was considered that a more powerful cruising vessel could be made by having auxiliary steam power and full sail power than the reverse, and good arguments were advanced for it, the principal being that a ship of war could keep the sea much longer.

I am not an advocate for extremes, but am certain that no ship will be a first-class cruiser unless she has sail enough to send her 13 knots through the water, off the wind, and 10 knots by the wind. That is about the speed of our old first-class frigates and ships of the line with their full bows. The finer lines of to-day ought to do better.

I will suppose a case of two ships of war meeting at sea, of equal size and weight of metal. The machinery of both vessels may be injured, and both may have to depend on their sails. The one that is the best rigged and with the position of the center of effort of the sails so fixed that the steamer will work as well as the old-fashioned sailing ships, which can be accomplished, will sail around the other vessel and compel her to surrender.

A ship of war for cruising, then, should not only be fitted with a full area of square sails, but she should have all the usual jibs and trysails, and have light stays between all the masts where the latter could be set. A ship so rigged would make the passage from New York to Australia, keeping in the trades, and steaming only through the tropics, almost as quickly as if under steam alone. It can easily be seen what an advantage a vessel rigged in this way would have over one with "auxiliary sail power." She could keep the sea as long as her provisions lasted.

It may be said that the comparatively narrow beam of modern ships is opposed to their carrying sail according to the ordinary rule, but the great length of these vessels, with the enormous weights of boilers and machinery carried low down, gives them a stability not possessed by the old-fashioned sailing ships of war, and they could carry topgallant sails when the latter would have to take a reef in the topsails.

I think no practical man will doubt the propriety of having our vessels of war equipped with sail power, with comparatively light masts and yards, and with the greatest possible number of light fore and aft sails that can be put upon them in ordinary weather to expedite a passage. If steel masts are objected to on account of the extra expense, pine spars could be used of much smaller proportions than the old

fashioned masts, although I consider steel preferable, as it reduces their size.

In case we should have a war with any foreign nation all ports will be closed against our cruisers, so far as obtaining coal or munitions of war is concerned, and our vessels after consuming their coal must either lie idly by until a supply is sent from home or make an effort to reach the United States under sail, with perhaps fuel enough on hand to run a blockade at the end of their cruise. Without full sail power, a ship of war would make but slow progress under these circumstances.

You have seen the Trenton under way with all her masts and yards aloft. She is a good specimen of a full-power sail and steam ship, though rather oversparred. With ten days' supply of coal, all she can carry for want of proper accommodations, the Trenton is superior in peace or war to any half-sparred cruising ship we can build. While her coal lasts she can steam at the rate of 13 knots an hour, and hold her own under sail with any frigate in existence. She could cruise if necessary for six months without using coal, and would prove a most formidable commerce destroyer to any nation with whom we might be at war, barring her want of great speed. But, after all, the Trenton is not a good *fighting ship* for a vessel of her size, and would be, in war, but a commerce destroyer.

You remember what the Alabama, with inferior size and slow speed, accomplished during the late civil war, and can easily imagine what a fast ship under sail, like the Trenton, having a fair amount of speed under steam, could accomplish against a mercantile marine, yet, as I have said before, as a fighting ship the Trenton is not a success.

While I was at the Yorktown celebration, in 1881, there was present the Magicienne, an old-fashioned French steam frigate. She carried twenty-four heavy 6-inch rifled guns on her gun-deck and four on her spar-deck, the latter to be used either as chase or broadside guns. This vessel ought to destroy the Trenton in about fifteen minutes, the latter being armed with 8-inch converted guns, of which no one gives a satisfactory account.

A vessel of even 2,500 tons displacement and with greater speed than the Trenton would not equal the latter as a commerce destroyer; that is, if she was a hybrid sail and steam vessel. A large portion of the ocean commerce is now carried on by swift steamships, many of which average their 15 knots across the Atlantic, and in time of war the greater part of an enemy's commerce would be carried in such vessels. Now and then a comparatively slow steamer might fall a prey to our cruisers, but this would not often happen. Nearly all the European steamship lines, Messageries, Peninsular and Oriental, &c., are composed of large and fast vessels, capable of overcoming the resistance of the heaviest seas, which would swamp a vessel of small dimensions attempting to force her way in chase.

The Boston and Atlanta are the smallest-sized commerce destroyers that should be built, and while it may be well to build eight or ten of the Dolphin class, as dispatch vessels to squadrons, I do not think they could be relied on to do any fighting in time of war. The Dolphin class of vessels could do little in such weather as one meets with in winter on the Atlantic, although to the great ocean steamers such weather is encountered with nearly the same ease as our steamboats make the run between Newport and New York.

It may seem absurd to apprehend a war between England and the United States, since their interests are so mixed up in commercial enterprises, but should such a calamity occur, most of the fast steamships

of Great Britain would be withdrawn from commerce and armed with heavy batteries. In such a case how long would it take for a steamship like the Oregon or the Alaska to overhaul and capture small "commerce destroyers"? The ocean would swarm with these converted merchant steamers, and they would effectually control it.

Therefore, while we are rebuilding our Navy it seems to me—and I know many thoughtful persons are of the same opinion—that we should build a class of swift vessels like the Oregon and the Alaska, and, if possible, more enduring. We might not need them in time of peace, but we should have them ready for emergencies, as the Army stores away artillery, muskets, torpedoes, and other munitions of war. It is not as if we had to build wooden vessels, the age of which is limited to a few years, for the proposed vessels would be constructed of iron that with proper care would last half a century.

During our late civil war, when England and France assumed a hostile attitude toward the United States Government and seemed desirous of a quarrel, our Government adopted a policy which caused those nations to stop and consider the probable consequences to them in case they should attempt to interfere in our concerns. Congress, on that occasion, did not stop to count the cost or speculate what might be the profits of contractors, but with a liberality which does them credit poured out the money in the Treasury, to spare our country the humiliation of being browbeaten by European powers, and thus averted what might have proved a catastrophe to the Union.

At that time English war and merchant steamers had reached what was considered perfection, but we went boldly to work, trusting to the ability of our constructors and machinists, and laid down the following vessels: Neshaminy, Idaho, Ammonoosuc, Manitou, Pushmataha, Guerrière, Illinois, Minnetonka, Piscataqua, Contoocook, Mosholu, Pampanoosuc, Kewaydin, Wampanoag, Antietam, Iowa, Ontario, Chattanooga, Madawaska, Hassalo, and Wautauga. Some of these vessels were never finished, and, owing to the return of peace, were left to rot on the stocks, in accordance with a long-established system in the United States Navy, by which millions of dollars' worth of property has been allowed to go to decay, all for the want of a sufficient annual appropriation by Congress for its care and preservation.

Some of the vessels above named were built of unseasoned timber, the best that could be procured at the moment, and soon went to decay, but those that were placed in commission gave such results in speed that our transatlantic friends paused to consider. The Wampanoag, now the Florida, when tried in rough weather, averaged $17\frac{1}{2}$ nautical miles an hour for over twenty-four consecutive hours, the fastest speed that had up to that time been made by any steamer on the ocean.

Had these vessels been built of iron we might not at this day be complaining of a decayed Navy, since, if properly taken care of, they must still be serviceable.

Now, here is a case where Congress appropriated money for 65,890 tons of fast steamers, real commerce destroyers, all larger than the proposed Boston class, and eleven of them as large or larger than the proposed Chicago. I hardly think the foreign Governments referred to would have been impressed with such vessels as the proposed Dolphin class.

No matter how fast a steamer may be, unless her guns are powerful she will have but little prestige. In time of war, especially a war in which Great Britain, France, or Germany is involved, their merchant

steamers will go heavily armed and be able to beat off any small cruisers with few guns. Great Britain has in her navy, or stored away in naval arsenals, nearly seven thousand rifled cannon, and could procure as many more in Europe at short notice. France and Germany have every facility, in their great workshops, for making all the guns they will ever need, and their naval arsenals are doubtless well supplied. Russia and Italy have great gun foundries, and doubtless all these nations have had forethought enough to provide guns, not only for the ships of war to be built in the future, but to arm all their merchant steamers available for war purposes.

Merchant steamers of the present day will become great factors in case of war, and many of them will be found even superior to unarmored ships built especially for war purposes. Vessels like the *Alaska* and *Oregon* would find no difficulty in carrying twenty 6-inch rifled guns, besides two 25-ton guns on pivots, properly protected with shields. I instance these two ships because they represent the latest and best type, and though they may appear to naval officers rather large to handle, a familiarity with this class of steamships would soon satisfy them that in time of war they would be successful ships. Their coal capacity would be tremendous; they could carry six months' provisions, and their commanders might laugh at Atlantic seas.

In adopting a policy for building up a navy in the future, great care should be taken that we do not fall back upon the construction of a small class of vessels, as seems to have been the policy since 1865. From the close of the civil war we have built no large vessel except the *Trenton*, and she only of 2,300 tons burden, or 3,900 tons displacement, and have used the available funds on vessels of 981 tons burden, or 2,200 tons displacement, none of which have equaled the old *Kearsarge* class of 695 tons burden, or 1,500 tons displacement.

The *Kearsarge* is to-day the best vessel of her class in the Navy. She sails and works like an old-fashioned sloop-of-war of the first class, making 12 knots or more per hour under full sail, and 12 knots under moderate steam. She is a good sea-boat and could go round the world without using coal, and do much better in time of war than a faster steamer with small sail power.

But though the *Kearsarge* might do service as a commerce destroyer, she is too small a vessel for war purposes, and could not contend like one of the great ocean steamers against heavy gales, making good time day after day and finally making port after a fair average passage. She is a good ship in time of peace, but though she battled successfully against her equal, the *Alabama*, she could not hold her own in a war with one of the naval powers of Europe.

There is, then, no use of building such vessels for the Navy either to defend the coast or as cruisers, for they cannot accomplish any weighty result.

In time of war the European powers would withdraw from service their inferior vessels, for, as well as ourselves, they all have vessels of the old types that are useful in time of peace, and can reach a friendly port at short notice for protection in case of war with a great maritime nation.

As it is universally admitted—and the action of the Inspection Board proves this—that we have no Navy either for offense or defense, I don't see any reason why Congress should not appropriate liberally for an immediate increase of the Navy, as it did in the time of the late civil war.

We are now, in fact, in as bad a condition as we were at the breaking

out of that conflict, though then we could conform to the law of nations by buying up every old ferry-boat and rattletrap that could mount a gun and using them to blockade the Southern ports.

We could not for a long time find a suitable vessel to pursue the *Alabama*, which was destroying our commerce at leisure and sending fifteen million dollars' worth of property to the depths of ocean. That one vessel, not of unusual speed, dealt a blow to our commerce from which it has never recovered, all because we had not a dozen fast cruisers to send to different parts of the world in pursuit of her and terminate her destructive career. Had we possessed the means of capturing the Confederate cruisers our commerce to-day might be in a flourishing condition despite the want of encouragement by Congress, but our ship-owners became disheartened with a system which gave no protection to their interests, and finding, when the war was over, that the Government took no steps to build up a navy, notwithstanding the late bitter experience, they gradually withdrew their money from investment in ships and placed it where it was safe from predatory attacks by any nation that chose to go to war with us.

If Spain, the least formidable of maritime nations, should go to war with us to-morrow, she would sweep our gradually increasing commerce from the ocean by setting afloat the large swift steamers she could buy in Europe, and we could not prevent it. Our vaunted "home squadron" and the "six tugs," which one of our statesmen declared a great auxiliary to our naval force, would retire under Sandy Hook or the friendly guns of Fortress Monroe, and be obliged to look quietly on while we were being despoiled, unless they chose to add to the laurels of the despoiler by offering themselves up as a sacrifice to satisfy public sentiment.

This is not an overdrawn picture; it is simply a statement of what is liable to happen. In the end we would no doubt get the better of our antagonists, but would that satisfy the country for a commerce destroyed or repay our people for ravaged coasts and burned cities, for, with all the new appliances for destroying human life and property, the horrors of war are likely to be greater than anything we have ever imagined.

With the private workshops we have in this country we could build twenty large ships in two years. How much better it would be for us to go to work and build a set of vessels for the immediate wants of the Navy. The argument that we can go on improving by building a few vessels at a time is a poor one. Europe in the last twenty years has made such strides in naval architecture that we have nothing to do but copy from the best existing models. We are not likely to improve much on what has been done abroad, and our vessels should reach the highest state of efficiency at present known. There is little difficulty in obtaining plans and specifications of any vessel that has been built, and we could, while holding to the main design, add such improvements as may suggest themselves to our shipbuilders. At all events let us have vessels with speed and guns enough to enable us to hold our own against any power in the world. Do not let us stand in the eyes of the world as a nation of shopkeepers without sufficient patriotism to be willing to spend a fair portion of our enormous revenue to protect our vast domain, which has resources superior to any other country.

What a pitiable exhibit for a country like this is the report of the Chief of Engineers, United States Army, who states that there is not one of our ports that has any defense against even an enemy of very inferior character. I know this to be the case from my own observation, for there is not a harbor in the country where an ordinary iron-clad

cannot pass the batteries, choosing their own time for so doing. So it appears that our Army defenses are in the same category as those of our Navy. It is therefore indispensable that both should forthwith take a new departure to insure that effectual protection to our countrymen which they have a right to demand.

It is natural that officers of the Navy, particularly captains and commanders, should be interested in having the types of vessels built to suit their own cases. Therefore they may incline to the smaller class of vessels as being the ones the Department must most likely use in time of peace, fearing the *personnel* may be reduced.

If the Navy is to be rebuilt on a system to suit the wants of the country, there ought to be vessels enough to give employment to all our officers. Captains will be able to get command of vessels from 3,000 to 5,000 tons, and the commanders, of all other vessels.

It is a great mistake to decrease the number of officers in a navy because ships through age or unworthiness are disappearing from the list and the Government has taken no steps to supply their places. The *personnel* of the Navy should be fixed on a permanent basis, and not changed simply because a few officers are left unemployed through no fault of their own. It takes a year or two to build a ship of war, but it takes a number of years to make a first-rate officer, who has to study continually to keep up with his profession and undergo eight examinations before reaching the grade of rear-admiral. Many years' service at sea and close application to study will not always make a first-rate officer, and it is unwise to cut down the *personnel* of a small navy like ours, for officers lost to the service in this way cannot have their places filled in a short time. It is better to build up the Navy and employ the officers. Because the soldiers of a regiment are destroyed in battle or by disease the number of its officers is not thereby diminished, but the ranks are again filled up to reach the Army standard.

If the law of the last Congress, condemning every vessel of the Navy that requires 20 per cent. repairs, is carried out, there will be many vessels retired in the course of a few years that could be kept in serviceable condition five or six years longer by increasing the percentage allowed for repairs. Building only a few vessels at a time, the Navy will be in worse condition than it is at present, and the Navy Register will show a large proportion of officers unemployed.

The 20 per cent. rule might work to advantage if Congress would rise to the occasion with the liberality they have before manifested towards the Navy in its hour of need, and not only appropriate money for the general increase of our ships, but also for the vessels that will be condemned, in the absence of such appropriation, two years from now.

The system of condemning such vessels of war as require an outlay of 20 per cent. for repairs is a wasteful one and ought to be abandoned; 40 per cent. would, in my judgment, be a more reasonable limit, and, by adopting it, many vessels might be saved to the service until we are able to build a real navy. For instance, the apprentice training ships, which cannot be dispensed with, will go on the retired list as soon as any attempt to repair them is made, and they will shortly require extensive repairs, while under a 40 per cent. rule they could be made to do duty eight years longer.

Take for example a steam vessel of war that originally cost \$600,000. Her engines and boilers, costing \$200,000, might be in good order, wanting but few repairs, while the hull would perhaps require 40 per cent. of

her cost to make it as good as new. This would be \$160,000. The 20 per cent. required by law would be in this case \$120,000; the vessel would be condemned and a new one built costing \$600,000. So by the 40 per cent. system the Government would expend only \$160,000, or less than half the cost of a new hull.

The same rule would apply to the engines and boilers of a ship which might be partly worn out while the hull was nearly as good as new, although such a state of things does not often happen, the hull generally giving way first.

No navy can be maintained economically when ships are condemned because the required repairs amount to 20 per cent. of their cost. Under this rule, in a few years, all the ships in the Navy would disappear, and be purchased by some of the small republics of South America, where, painted and patched up, they would run for years.

To my knowledge too high an estimate has hitherto been given for repairs at our navy-yards. Employés of a navy-yard will naturally incline to the opinion that a ship wants extensive repairs. They want to make work for the people in the yard, and it sometimes happens that a ship has more than twice the amount of repairs put upon her than she requires. I remember the case of the frigate *Constitution* as far back as the year 1843. She was condemned to be rebuilt entirely, when Captain Percival, a prime old-fashioned sailor, applied to the Department to permit him to take command of the ship as she was, with hull, spars, sails, and boats, and make a voyage around the world. Permission was granted and the voyage was made. The ship was absent some two years, proved herself a staunch vessel, and outsailed every ship of war she fell in with.

There have been many cases where ships have been pulled to pieces unnecessarily, but after all we thereby obtained what was practically a new vessel at a smaller cost than it would have required to have constructed her in any other manner.

There is a very simple remedy to prevent the unnecessary pulling to pieces of ships requiring repairs, and to prevent unnecessary repairs to boilers and engines. I recommend that no ship be repaired until she has been carefully examined by the Board of Inspection and Survey now established by law, the amount of repairs to be limited to the amount recommended by the Board. At present a ship requiring repairs is surveyed by a board of officers belonging to the navy-yard, assisted by the master workmen as experts. Under such circumstances an impartial survey is hardly to be expected; it would require too much from human nature. The master workmen are not going to throw away a chance of prolonging their employment and that of the numerous mechanics under them. The plan I propose will, I believe, much improve the present manner of surveying vessels requiring repairs.

I do not think captains and commanders need despair of obtaining commands even if the present plan of the Advisory Board is carried out. Besides the cruisers, I notice the Board propose a class of vessels greatly needed in the Navy for coast defense and for duty in the Chinese waters. Late events have shown the necessity of maintaining a strong naval force in that quarter in the shape of vessels that can penetrate the rivers of China.

I think the Board correct in the estimate of the tonnage and draught of water these vessels should have. They could be made the most effective in the world of their class, and, if moderately plated with steel about the bows, could operate in inland waters, even against forts, with more

effect than larger vessels. Not being obliged to cruise at sea, they could carry at least a 35-ton gun forward and two 6-inch rifles aft.

The English and French have this class of vessel, and the Chinese themselves possess a sufficient number to drive our present naval force from their ports unless the latter was supported by the class of vessels recommended by the Advisory Board. These small vessels could be built with much greater celerity than larger ones, and there is scarcely a good machine shop in the country that could not furnish their comparatively small engines. We are so deficient in coast defenses that the proposed vessels, armed with heavy guns, would be a valuable auxiliary in this direction.

In speaking of smaller vessels, I include also the heavy armed gun-boats recommended by the Advisory Board as forming part of a naval system for coast defense. If the Board had recommended twenty of these gun-boats to be built at once, instead of two, its action, in view of the present defenseless condition of our coast, would have met the approval of the country. Besides their duties as gun-boats, these vessels could act as torpedo-boats to accompany a fleet, or act against single vessels at night or in a fog.

The future torpedo will doubtless be sent against an enemy by motive power of its own, and such vessels as are recommended, having good speed, would be the best size to send them from. It takes a long time to build monitors and iron-clads, and until the latter are built, which must follow in the course of time, for a complete defense against an enemy, we must have the vessels to which I have referred.

There is not a harbor along our southern coast that is at this moment protected against a pirate—if such a craft could get afloat—and any of the vessels fitted out in this country for the purpose of violating international law by warring against our neighbors, could enter any southern port and set the authorities at defiance. If the Department should be asked for a gun-boat to arrest such marauders, it could not supply one.

I have long had in my mind the class of vessels referred to, and about the year 1872 devised one, about which I beg leave to make a few remarks.

This vessel, the *Alarm*, has been the subject of much criticism and misrepresentation, and as she is an experiment to try the different types of propellers and steering machines, her character has been misunderstood; but she is to-day, for her size, the staunchest, fastest, and heaviest armed vessel yet constructed anywhere.

I had long foreseen the defenseless condition of our sea-coast, if attacked by foreign iron-clads, owing to our want of naval vessels of a proper type, superior in power of resisting shot and in size, endurance, and speed to those which could be brought against us. The enormous cost of such vessels would prevent their being built before there was an absolute necessity for their use, and when that necessity arrived the slowness of their construction would prevent them from being completed in time to be of service. We experienced the disastrous effect of these causes during the late war. The large and very fast unarmored cruisers commenced by the Navy Department immediately after the beginning of hostilities, for the purpose of offshore blockade and of resisting European interference, were only ready after the war was ended. When the enormous effect of the naval blockade and of the naval expeditions upon the result of that war is considered, an effect believed by many to have been decisive, the value of being able to make the one more stringent and the others more powerful at an early period in the struggle can scarcely be overestimated.

Influenced by these considerations, the problem seemed to me to be the devising of some means by which small vessels, cheaply and rapidly built, might be made effective in the defense of our coasts and harbors against foreign vessels of war. Evidently there was no existing type of unarmored vessel which could fulfill these requirements, so I was compelled to abandon all preconceptions and devise an entirely new type, my ideas on the subject being finally embodied in the Alarm, a vessel which after numerous careful experiments is proved to possess all the desirable qualities I had hoped to combine in her. No improvements have since been made on this vessel as regards dimensions, capability of safely carrying and effectively using the largest known gun, and absolute perfection in maneuvering, by which latter is meant power of turning on her own center of gravity when at rest, with great rapidity, of turning in a circle in the minimum of time and space when under way, of advancing and retreating with equal precision as to direction, and of instantly changing from forward to backward motion. She can bristle with torpedoes, and, with either gun or torpedo, is the most formidable vessel for her size afloat. Several vessels of this kind would prove successful in a combined attack on a large iron-clad.

My greatest difficulty in planning the Alarm was to obtain machinery that would enable me to realize my designs, especially in regard to the maneuvering power. It was necessary that the steering apparatus should be absolutely perfect; that is, turn the vessel rapidly when at rest, either entirely around, on her center of gravity, or with accuracy through any desired horizontal arc; or, that when the vessel was under way, would turn her in a circle of any given diameter, or any required part of such circle, quickly and with precision; or, that would enable the course of the vessel to be almost instantly changed from ahead to astern, or *vice versa*, without stopping the motive engines or interfering in any way with their action.

The steering apparatus had necessarily to be directly controlled and managed by the officer on deck directing the maneuvering, and such steering efficiency as this could be obtained only from the propeller itself and by the application to it of the entire power of the motive engines. But while the steering was to have all the perfection required, there must be no sacrifice of the vessel's speed to obtain it.

These are very difficult conditions to achieve under any circumstances, and seemed insuperable at the time I was planning the Alarm.

After a careful examination of all the plans that suggested themselves, I decided to adopt provisionally, until something better could be devised, the submerged feathering paddle-wheel placed horizontally, which, although it had never been tried, gave hope of success. This wheel when experimented with completely fulfilled its promise as regards steering efficiency. Its maneuvering power was perfect. Its command over the vessel in this respect was so absolute, and the control so entirely in the hands of the commanding officer that he was able to manage the vessel without communicating with the engine-room, the motive engines working uninterruptedly in one direction and at full speed, whether the vessel was going ahead, backing, or turning. In short, the whole power of the motive engines, without intermission, was applied continuously to the maneuvering.

But as regards giving the vessel the required speed, this wheel was not a success. The trials developed an unsuspected but decided waste of power involved in the direct propelling effort, and to this extent its performance was unsatisfactory.

At this time Col. William H. Mallory brought forward his steering

and propelling system. As the propeller was the usual screw employed for submarine propulsion, and most advantageously placed as regards the hull, while the steering qualities were of the same kind as those of the feathering wheel, but with increased efficiency, I saw that the device would enable me to solve my problem, and as the Alarm was essentially an experimental vessel, I determined to substitute the Mallory system for its predecessor, especially as the change could be made at small expense without modifying the motive engines or altering the hull of the vessel.

The change having been made, the Alarm was subjected to a thorough course of experiments, with the most gratifying results. The vessel achieved high speed, perfect efficiency in maneuvering, and left nothing to be desired except some improvements in a few mechanical details suggested by the trials, for in this case, the subject being entirely new, there was no previous experience for a guide.

The motive engines are not as well adapted to the vessel as they should be, but the boilers are sufficient to give her a maximum speed of fourteen knots per hour, which would be realized by new engines better adapted for the economical use of the steam. Such a speed, it must be remembered, is very great for a sea-going vessel of the Alarm's tonnage.

As the Alarm is now, she has no equal for the purposes for which she was built. She is large enough, carries coal enough, and has sufficient accommodations for officers and crew, to maintain her position off the coast in any weather for any reasonable time. She can carry the heaviest gun that can be made up to 60 tons weight, and can use it with a rapidity and precision of fire greater than any other vessel. The hull itself is the gun-carriage, the gun having only a forward and back movement on fixed guides in the fore and aft direction of the vessel. Its training in azimuth is done by the steering apparatus, the entire power of the motive engines being applicable for the purpose. All that the gun's crew have to do, besides loading and firing, is to elevate or depress the muzzle. The vessel, whether advancing or retreating, always has her bow presented to the enemy, thus offering the smallest possible target, and with acute angles of inclination, so that the thin armoring on her bow is a considerable protection. The same gun is used with the same efficiency with the vessel at rest or moving towards or from its object. The peculiar construction of the vessel forward allows her heavy gun to be properly carried and fired without straining the hull. The main torpedo, of the largest and most destructive kind, is protruded by proper mechanism directly forward, below the water line, from the interior of the vessel, the crew working it being well protected from the enemy's fire.

Thus far, then, the Alarm may be considered a complete accomplishment of the uses for which she was designed, and she is the only type of small vessel that, combined in sufficient numbers, could be successfully opposed to iron-clads blockading our harbors or attacking our cities. Her offensive power, in proportion to its money cost, is greater than that of any other vessel, and in case of sudden hostilities with a first-class naval power vessels of this kind are the only ones that could be built fast enough and cheaply enough to be used for home defense in the first shock of the encounter.

Other plans have of late been brought forward for increasing the maneuvering power of war steamers, such as discharging water from a pipe at the stern of the vessel and directly at right angles to the keel, &c., but the difficulty of obtaining the proper mechanical conditions

with them, and their inefficiency compared with the system used on board the Alarm, will always prevent their use.

The latest plan for maneuvering vessels by the propelling screw is known as "I. I. Kunstader's patent screw steering apparatus." This arrangement employs two screws of different dimensions, one of which is situated immediately behind the stern-post, and the other behind the rudder. Of the aggregate surface in the two screws, the first contains about two-thirds and the last about one-third. When the rudder is in the direction of the keel, the axes of both screws are in the same straight line. There is nothing peculiar in the large screw, which is fixed upon its shaft in the usual manner. To this shaft, extended through the large screw, the shaft of the smaller screw is connected by a universal joint, the use of which is to allow the smaller screw to be revolved propulsively by the shaft of the large one, while it has also the sideways movement of the rudder upon which the small screw is supported by a pillar-block in the usual manner. When the rudder is moved by any power applied to the tiller, it carries the small screw with it, and as the latter is revolved by the main engine shaft, a part of the power of that engine is applied obliquely to the direction of the keel, and deflects or steers the vessel accordingly. A fraction of one-third of the power of the motive engine, depending on the obliquity of the rudder, is so applied, and this steering effect is additional to that of the rudder, the two acting in unison.

The method of steering by the propelling screw supported upon the rudder and connected to the shaft of the motive engine by a universal joint is a very old one, and is known as the swiveling screw. It had its origin in the very infancy of screw propulsion, and has frequently been proposed since.

The mechanical objections to it are so great and its capabilities so limited that it has never come into practical use and probably never will. The swiveling of the screw heretofore proposed was for a single screw, the universal joint being situated between the sternpost of the vessel and the screw, the latter being supported on the rudder, whereby the entire power of the motive engine could be applied to the steering simultaneously with the power of the rudder; and if ever the swiveling system is adopted—and there is not the least likelihood it ever will be on its own merits—this is evidently its best application.

An arrangement of the swiveling system, so elegant and mechanical that no improvement upon it has ever been made, was patented in England in 1862 by William Joseph Curtis. Of Curtis's arrangement, Bourne remarks in his work on the screw propeller:

This appears to me one of the most skillfully-designed arrangements for steering by swiveling the screw, but in all such contrivances there is too much mechanism subjected to a heavy strain, and too many inaccessible joints, to render the practical adoption of such ingenuities advisable, especially as no appreciable benefit seems to have been realized by any of these refinements hitherto tested.

Mr. Bourne's opinion is as sound to-day as when it was written. If, however, the swiveling system be attempted, why should its steering action be restricted to only a fraction of one-third of the power of the motive engine, by limiting its application to a small supplemental screw, instead of using the entire screw surface, and the entire engine power upon it, as Curtis and others proposed? True, the single swiveling screw and universal joint are not patentable, but if the screw be divided into two parts, perhaps the division is, though productive of an inferior result. Mr. Kunstader's method may be the best for patent fees or royalties, but it is certainly the worst for the steering of the vessel. Under no circumstances, however, can the swiveling system be ap-

plied to vessels like the Alarm. Its capabilities are too limited and its action too feeble and slow. It cannot be used to maneuver the vessel or turn her upon her center of gravity without changing her position—that is, without giving her a forward movement. It cannot be used for backing without reversing the motive engines, and is, in fact, much inferior in maneuvering power to twin screws, a system too slow in its action and too imperfect even under favorable conditions.

Upon a full review of the subject, and taking into consideration all its developments up to the present date, I find that nothing has been devised equal to the Alarm, and I am of opinion that vessels of her type should be constructed for home defense, with all the mechanical improvements suggested by the experiments with her. In this manner, and at very small expense, we can be in much better state of preparation for resisting a naval attack than by any other method of expending the same sum.

This plan of fighting small vessels bow on, with the power to recede rapidly sternways from an enemy, and again approaching without the vessel's turning her broadside, is founded on correct principles. A vessel, say of two hundred feet in length, instead of presenting that surface to be fired at, presents only the small surface of 22 by 6 feet, the former being a target of 1,200 square feet, the other only a target of 132 square feet, and the uncertainty of striking such a moving target in a seaway, especially with rifled shot which cannot be fired in ricochet.

There are many examples which show the difficulty in striking vessels at sea end on. Witness the many ships chased during the war of 1812, and the numerous blockade-runners fired at sometimes by three or four vessels at once during the late civil war, without being struck. Any kind of firing at sea is an uncertain matter, especially in vessels not built on scientific principles, and not offering a steady platform for guns. This consideration seems to be the last one with modern constructors; hence we see vessels built with bottoms like a barrel that roll themselves to pieces and offer the worst possible platform for guns. All this would have to be carefully considered in light-draught vessels, such as would be required for gun-boats; and I venture to say that if the principle of the Alarm is followed, we will have perfectly steady vessels even in a rough seaway for the Alarm is the steadiest vessel I ever saw, and even in a gale of wind and heavy sea does not roll over ten degrees.

He who undertakes to provide for the defense of the coasts and harbors of the United States must needs be very familiar with their hydrography and topography. If unwise representatives lose sight of the vast interests at stake upon our defenseless coasts owing to their absorption in local matters, they must not consider an officer who has held important trusts insane because he would repair, as soon as possible, the deficiencies that have existed for years. It is a most natural thing to wish to know when the Treasury is in condition to meet the demands of the Navy, and when what we have been foolishly calling a Navy for some years is at its lowest ebb, it is very unwise to try and make it appear that we have a real Navy for defense or for anything else. We have still a few ships that will answer to potter around in the smooth waters of the Mediterranean or South Pacific, but they do not represent an advancing nation like our own, which is ahead of most in all that is called progress. I look at this matter as an expert who knows what will happen if the storms of war should burst upon us. Parties, and leaders of parties, those who have held power and failed to provide means of national defense, will be held to a strict account if the calamity of war should be forced upon us, and our coasts and harbors laid waste by some

comparatively insignificant enemy, without our having any means at hand to prevent it.

Some persons, wise in their own conceit, argue that as we have no commerce we do not need a navy, and even the late Senator Sumner was in favor of diverting the amount yearly appropriated for its support, for colleges and charitable institutions. Others have recommended that the funds now appropriated to maintain the Navy be devoted to building up the mercantile marine, forgetting that Congress has the power to build up such a marine by a much simpler method. The idea seems general that we must first establish a merchant marine, and the Navy grow up to it as it advances.

But even at the present time our merchant marine is not so small an affair as most people seem to imagine. In 1882 we had in foreign trade, 1,269,492 tons; in the coasting trade, 2,795,776 tons; in the whale fishery, 32,802 tons, and in the cod and mackerel fisheries, 77,863 tons. Of these 2,810,108 tons were sailing vessels and 1,355,823 tons were steam-vessels, the whole amounting to 4,165,933 tons. Sailing ships and steamers are, I may say, building rapidly along our eastern coast, and in the city of Bath alone, this last year, as large a number of vessels were constructed as in any preceding year of prosperous times, including two ships of 2,300 tons each. Certainly all this trade requires adequate protection, which it will not obtain while we go on building ships of war at the rate of three or four a year.

In case we were to be involved in war, one fast merchant vessel of the latest type would have our merchant fleet at her mercy, and the ocean would again be lighted up by the flames of American ships as in the days of the *Alabama*. But it is not one fast vessel we have to fear; in all probability several hundred of them would assail our commerce, and the mercantile marine that in the last eight years has begun to raise its head may be again reduced to the small tonnage of 1865.

We are at peace with all the world, but that peace is liable to interruption at any moment, either from interested motives on the part of another nation or from some action of our own in retaliation for wrongs inflicted upon us with the idea that we are too insignificant a navy a power to be feared.

No mercantile marine can grow up and flourish unsupported by a navy. The mercantile marine of Great Britain is the most striking instance of this, penetrating as it does to every corner of the world where a market is to be found, and supported by a great naval force, which fully protects it. An English vessel is sacred the world over in civilized and in savage countries. What commerce we have abroad receives little protection from our Navy, which is too small even to gladden the hearts of our countrymen by an occasional sight of the American flag.

Although we are on friendly terms with Great Britain and united with her by ties of kindred and numerous interests, yet war is possible even with that great naval power. On two occasions since 1862 we have been on the verge of a war with England, once on account of the Trent affair, and again when the *Alabama* claims were pending. The fishery question has offered some disagreeable points, and we can never tell what questions may arise to jeopardize the peace of the two nations.

The commercial marine is the life of Great Britain, and the nation has never hesitated to go to war when it seemed to suit the interest of her commerce to do so. When her commercial prestige is in danger of being impaired she is likely to preserve it by going to war, without regard to expense, and sometimes without regard to justice. This has been the

policy of England for centuries, and she might find reasons even for involving us in war with her. The war of the rebellion threw a large portion of our commercial marine into her hands, our ships taking safety under the British flag to obtain that protection we were unable to give them, and this state of things will again happen if we become involved in war with any power that could afford to fit out steamers that could overtake our commerce on the high seas. Our civil war and the ravages of two or three small Confederate cruisers threw over one-third of our commerce into British hands, reducing us from 5,000,000 to 3,000,000 of tons, and increasing the tonnage of Great Britain from 5,500,000 to 9,000,000 of tons, of which about 7,600,000 was registered tonnage. This peaceful transfer of our commercial marine to the British flag did much towards keeping peaceful relations between the two countries, for Great Britain might, on several occasions, have taken the opportunity to force a war upon us and thus become the sole carrier of that great trade which increased and multiplied in such an astonishing degree. Having for a time absorbed a great part of our tonnage on the ocean, and a great impetus having been given to the steam tonnage by which she has covered the ocean with great steamers, England can afford to be satisfied with the present situation, but if we had obtained the commercial supremacy it is doubtful if England would remain on good terms with us.

After all, we must admire the nation that leaves nothing untried to foster the interest of its citizens in all parts of the world, even although their statesmen are ready to do injustice to others. It is perhaps only the natural right one nation has over another that has failed to improve its opportunities.

Who that has seen the British navy in all its power and pride does not honor the spirit which has made it the most formidable in the world from the time of Queen Elizabeth? What is to prevent the American people from following in the footsteps of the British and building up a navy, on which our power as a nation and the success of our commerce depend? I do not hesitate to assert that had we kept up our Navy to the standard of our once rapidly increasing mercantile marine, we would have to-day nearly as many merchant vessels upon the ocean as Great Britain. Our merchants lost heart when during the civil war they saw the Government doing so little to stop the ravages of two or three inferior Confederate cruisers, sending vessels in pursuit that could not catch them even if they saw them. With all our Navy we had not a vessel that could catch the Alabama until she offered herself up to be captured.

The most expensive and least effectual way of building up a navy is to wait until war is actually declared. The state of affairs has changed since 1812, when Perry in a month or two built and equipped a fleet on Lake Erie with as much celerity as the English, and a preponderance of one or two small schooners over the enemy gave him the command of the lakes. Nowadays it takes two years to build an effective commerce-destroyer, and at least a year to build a ship of ordinary size, although twenty could be built at the same time as well as three or four.

When I speak of our unprotected coast, I refer to our lake coast as well. The commerce of our great lakes is unprotected, and no steps are taken to remedy this state of affairs. In this quarter the only nation we should ever have to contend with would be Great Britain, whose territories face our own, and where we can shake hands across the border. In case of war between Great Britain and the United States it would be comparatively easy for the former to get possession of all the lakes, and with her powerful navy lay our cities under contribution or destroy them. It is foolishly said that in case of war with

Great Britain all her lake and Canada commerce and Canada itself will fall into our hands, as if that would compensate us for the destruction of our trade, the plunder of our coasts, and the lives of our citizens. The worst thing of all would be the humiliation of the American people in having to submit to whatever terms our enemy chose to impose upon us.

It is generally imagined that we have practically possession of the lakes, and that in a few hours we could land a sufficient force on the opposite shores to overrun Canada. Even if that were possible, "the game would not be worth the candle." But let us consider how the matter really stands.

Canada has been engaged for some years in widening and deepening the Welland Canal, at a cost up to the present time of some \$20,000,000, making the width 280 feet, the locks 75 feet, and the depth 17 or 18 feet. The ostensible object of this enlargement is to introduce merchant vessels of greater size and take grain directly from the lakes to Europe, the result of which would be to greatly diminish the lake commerce proper, now amounting to over 600,000 tons.

But there is another object in thus improving a canal on British territory, and that is to admit vessels of war upon the lakes. Here again we see the result of British statesmanship, which, while striving to extend its country's commerce, never neglects to provide means for its protection. When the Canadian canals are completed, heavy war vessels, temporarily lightened, can be carried through to the lakes, and war would hardly be declared before Lake Erie would swarm with British iron-clads and gun-boats, commanding all the shore of the lakes, even to Duluth. Under such circumstances what chance would there be of our crossing the lakes or marching an army into Canada except through the wilderness of Maine or around Lake Superior, with the risk of being cut off from our base of supplies, which might prove fatal to us.

This may be considered an extreme statement, but it is what would happen in case of war with Great Britain, who, although probably not valuing Canada as highly as the Canadians themselves, would leave no efforts untried to hold the country.

For this reason we should pay proper attention to our defenses on the shores of the great lakes. The dangers threatened here appeal directly to our representatives from the West. The Western people are supposed to be indifferent to the increase of our Navy, considering themselves secure from the attacks of a foreign foe, but if they should see all the American vessels on the lakes destroyed or captured, they would realize too late the necessity of defending the vast interests we have in that quarter.

After the war of 1812 we were limited by treaty to keeping a single vessel of war upon the lakes, carrying only one gun, and the English were bound by the same rule. This agreement was virtually ignored by Great Britain during the Fenian troubles in 1865-'66, when three gun-boats passed the Welland Canal, not then deepened, into Lake Erie for the protection of the Canadian coasts, and these vessels lay before Buffalo, menacing the Fenians, who, in their zeal to invade a peaceful country, never dreamed of having to encounter British vessels of war, ready to cut them off on their first attempt to cross into Canada. That incident did more toward arresting the Fenian invasion, which it was the duty of our Government to have suppressed, than any authority we could exert. We had no gun-boats, and our solitary Government steamer, which is little better than a tow-boat, was probably engaged at the moment in hauling some vessel out of the mud, or else her engines were out of order!

Since that time the treaty has been looked upon as a dead letter, and, if I remember rightly, our Government notified Great Britain of its desire that the compact should terminate. At all events, the fact that the English had three gun-boats on the lakes in 1865-'66 relieves us from further adherence to the treaty, and there is no reason why we should not commence to build on the lake shore one or two of the heaviest iron-clads (with powerful guns) of good speed and impervious to the heaviest shot. There is every facility for constructing such vessels on Lake Erie, and one such ship stationed near Buffalo could, in case of threatened hostilities, drop down to the mouth of the Welland Canal, and with shot and shell demolish the entrance docks, &c., rendering the work useless for naval or military purposes. Even should a vessel succeed in passing the canal, she would be immediately destroyed. I would recommend that one of the proposed iron-clads be built on Lake Ontario, and kept on the stocks ready for launching in case of necessity. It is much easier to build iron-clads for the lakes that will bear the heaviest weight of iron in those comparatively smooth waters than it would be to build similar vessels intended to operate on our stormy coast.

What I have said with regard to the dangers on the lakes may be considered hypothetical, but it is the part of wisdom for a nation to prepare against any contingencies.

England is the only nation with whom we have ever seriously gone to war upon the ocean, and although the English and ourselves have a common origin, speak the same language, and live under similar laws, these circumstances, which should cement our friendship, seem to be no barrier to misunderstandings which are liable to lead to deplorable results.

Great Britain does not hesitate to advance claims for infractions of her rights, knowing her power to enforce them, while we are always ready to resist any invasion of our rights, without any power to enforce anything. A nation as sensitive as ours, and always impatient to rush into extremities when we consider our rights invaded, should at all times be prepared for offense and defense, or at least we should take the necessary measures to keep enemies out of our ports and prevent our great cities from being laid waste.

It is a great humiliation for a nation, after passing through an expensive and destructive war, to be obliged in the end to pay all her enemy's expenses, either in money or cession of territory, besides losing all her commerce and having it added to that of her adversary. But these are terms which conquerors sometimes impose, and we have an instance where Germany required France, one of the most powerful nations of Europe, to pay all the expenses of the war between the two countries.

It has been shown by the present able Chief of Engineers, United States Army, how deficient we are in coast defenses, particularly in heavy rifled guns, which we seem to be able to make only in such small quantities that it would require a century to supply our necessities from our own foundries. As our military works are so inadequate for the defense of our coasts and harbors, we should, while building cruisers, proceed with the construction of iron-clads of the monitor type, which I consider the best vessel for coast and harbor defense. No forts can hold their own against an attack of heavily armored vessels without the support of iron-clads. This was demonstrated during our late civil war, where powerful forts succumbed to wooden ships and smooth-bore guns. What vessels we build should be the best of their class in endurance, speed, and the character of their guns. The few small iron-clads we now possess may be fit to co-operate with forts or help to keep an enemy's gun-boats out of small rivers or harbors, but their presence would not count

for much in time of war. The few larger iron-clads that we propose to finish would perform good service as far as their limited numbers go. After all, they will carry but a small number of guns, and would offer but temporary resistance to a powerful enemy. We should build two or three of these vessels yearly, and should continue building them until the general voice of the Navy proclaims their number sufficient to give ample protection to our coast.

We appropriate large sums for the improvement of rivers and harbors, and public buildings of all kinds, yet in regard to the Navy our Government has been the most short-sighted and sluggish of any in the world. At times when aroused to great effort we have achieved important results; but after building some ships, which went to decay in a few years, we have relapsed into a deeper slumber than ever. A navy which cost millions, and might have kept on increasing, had to be pulled to pieces and thrown into the scrap heap with greater rapidity than it was built.

The situation has entirely changed since all the world built wooden ships. Now iron is king, and in beginning to build a new navy we necessarily throw aside the old wooden vessels, as England and France did their splendid three-deckers when the battle between the Monitor and the Merrimack taught them that wood was no longer suitable for ships of war. These nations hesitated no more than would the average man to discard an old coat when the fashion changed.

It is all very well for the United States to grow rich and prosperous with commercial resources far ahead of all the world, but what is the use of it all if the people are unwilling to provide proper defenses? One year of war without our being able to strike an effective blow would cost more than it would take to build half a dozen navies like that of Great Britain, and such a war could easily be averted by making even a moderate show of preparation.

TORPEDOES.

Much stress is laid by military authorities on the security against an invasion that will be afforded our ports owing to the preparations we have made to defend them by torpedoes. I claim to understand thoroughly the effect torpedoes will have on a naval power. I have had experience in that kind of warfare, and can truly say that although torpedoes have considerable moral effect, yet they never prevented any expedition during the late civil war. The Confederates used them by the thousand in rivers and harbors, and even on the open coast. They had as great a variety and as dangerous kinds as we have to-day, with excellently drilled men to manage them. I have seen hundreds of these torpedoes taken up without loss under a heavy fire as the ships advanced, and such will always be the case when an enemy has a powerful fleet under the guns of which boats and divers can be protected from the fire of forts or from the attacks of gun-boats sent out to interfere with those operating against torpedoes and torpedo mines.

In these days, when men can stay under water five or six hours at a time, and when the electric light can be used to illuminate the bottom, it would not be a very difficult matter to make torpedoes powerless against the passage of a fleet, unless the party on the defensive is also supported by powerful vessels that can operate under the protection of its forts and cut off and destroy the enemy's divers and small boats.

Torpedoes properly planted on the bottom are powerful adjuncts to a proper force in preventing an enemy's passage into a harbor or up a

river, but in this kind of warfare torpedo-boats are particularly necessary to drive off ships or to meet the torpedo-boats of an opposing force. Every foreign iron-clad of any size carries from two to four torpedo-boats of from 50 to 60 feet in length, of great speed, and very formidable.

While we are mapping out a system for our Navy we should commence at once to build a class of torpedo-boats 100 feet in length that could not only help to protect our harbors, but could also operate off our coasts in moderate weather, for no torpedo-boats or torpedoes will be found very effectual in rough weather. The moral effect of such vessels will far exceed that of any submerged torpedoes. We could build strong iron vessels of this class which would last many years, and would make, with the Herreshoff coil and engine, 20 knots an hour, and be impervious to Hotchkiss shell and mitrailleuse. We should build at least fifteen such boats at once, and their cost would be moderate. You can scarcely enter a fitting-out port of one of the great powers where you will not see a number of these torpedo-boats steaming around, practicing on dummies prepared for the purpose, and showing their readiness at all times for action the same as if the nation was at war. They are considered as necessary for the defense of a harbor as forts or iron-clads.

While we are provided with a torpedo station and school where the elementary principles of this kind of warfare are taught, the school has never yet been provided with a proper torpedo-boat, by means of which officers under instruction could put in practice the theories they were acquiring, although no officer can be thoroughly instructed in torpedo warfare until he has had experience in the management of torpedo-boats. The most that the students at the school have probably seen is a decrepit old steam launch with a wooden bar stuck out in front, a method in use more than twenty years ago, and offering neither the certainty nor security of a properly constructed apparatus.

The explosion of the torpedo is apt to fill such a boat with water, rendering her powerless to escape from the enemy. This was the fate of the launch operated by Cushing against the *Albemarle*, and she was a better boat than any I have ever seen since in the Navy, and used comparatively a small charge of powder. No ordinary steam launch or tug would serve, as many people seem to think, the purpose of a torpedo-boat for harbor defense. Such a torpedo-boat must not only be large enough to fire a heavy charge of gun-cotton from a properly devised spar of wood or iron, have speed enough to escape from an enemy if pursued, and be impervious to Hotchkiss and mitrailleuse guns; these vessels should also be large enough to carry and discharge from four to six motive torpedoes not weighing less than 550 pounds. Such vessels would be formidable, and no other description of torpedo-boat would be worth the expense of building.

THE MERCANTILE MARINE—ITS NECESSITY TO THE NAVY.

I have long looked forward to the time when Congress would take some steps towards resuscitating our mercantile marine, which has long been languishing for the want of Government action in its behalf. A large number of merchant steamships would in time of war be an important adjunct to our regular naval force, for many of them would, with comparatively little alteration, make the best commerce-destroyers in the world, and also the best destroyers of commerce-destroyers.

Two of the most formidable vessels of this kind in the Russian navy were built by Cramp & Sons, of Philadelphia, for the merchant service.

They carry a large amount of coal and provisions, and, in case of necessity, could run away from the fastest cruisers.

If we ever succeed in building up a mercantile marine the Navy would feel assured that the vessels would obtain the best speed. We were the first nation to build large and fast steamers, and would not feel satisfied until we had outstripped the best vessels now afloat.

It is only necessary to glance at the list of fast merchant steamers belonging to England, France, and Germany to see what an influence they must exert in a war with a commercial nation. England alone would cover the ocean, with the aid of her coal mines, as she did formerly with her canvas, and commerce-destroyers of other nations, unless they had great speed, would be gathered in with perplexing rapidity. There is no part of the world where the British flag does not float over some fast and powerful steamer, all ready in case of necessity to be converted into a ship of war, and after receiving her commission and guns, with a trained crew, she would be ready in a few weeks to go forth on her mission of destruction. Many of these British steamers are running to our own shores, and we pay them a yearly tribute of \$130,000,000 for carrying our produce and passengers to Europe. Great Britain, by giving every possible encouragement to her commercial marine, adds enormously to the strength of her navy in time of war, and makes her ocean steamers not only their own protectors, but the destroyers of her enemies. This great fleet of steamers has been built up by subsidizing the lines until they are able to do without such assistance.

No wonder Great Britain has become the great commercial nation of the world, and made all other nations pay tribute to her for carrying their products. Her statesmen do not raise the cry of "taxing the people" when asked to assist some proposed steam line to enter upon its career. They do not waste precious time in investigating matters which should be plain to the commonest understanding, but are ready to spend a million of dollars so that twenty millions will flow into British coffers. Instead of taxing our people by subsidies, "we are making them lose over three hundred millions a year in the last ten years." (See Secretary Frelinghuysen's letter on the commerce of the world.)

From 1872 to 1882, British imports were \$18,363,340,000; exports, \$13,566,661,000; showing a balance of trade against her of \$4,796,670,000, three times the amount of our national debt. We have paid a large share of this bounty to British mechanics, and not a dollar of it has remained in this country. The position we hold in the carrying trade of the world is simply humiliating; it is absolute dependence and subservency; and we lose by it a large fleet of fast steamers that would equal or exceed for many purposes in time of war any that we could build in the Navy.

The first step to be taken to remedy these evils is to establish a Government Board of Trade, to represent the wants of our commerce and make such recommendations from time to time as would tend to bring our commercial marine to its proper standard, enabling us to carry a large share of our exports and imports. This Board of Trade should be connected with the Navy Department, and the Secretary of the Navy should have supervision over all ocean steam lines, to see that their vessels were constructed with proper strength and swiftness to render them capable of conversion into ships of war.

There would be no necessity for subsidizing our lines of steamers further than by paying them a liberal compensation for carrying all our mails; so we would hear no more of the cry of "taxation" which is raised by British lobbyists every time Congress makes any attempt to

revive our commercial marine. This cry of "taxation" might be urged with far more force against our tariff, which is imposed to protect our home industries, and which is ten times more onerous than any subsidy ever likely to be given to our steam lines.

If it was not for her great ocean steam lines, Great Britain would require ten times the number of vessels in her navy that she has at present, for her coast must be defended against all Europe, and her mercantile marine protected, no matter what the expense. She extends her arms over it as a mother would over her children.

In 1849, when the great exodus to the California gold mines took place, Congress, seeing the great advantages of such a course, established a line of mail steamers from New York to the Isthmus of Panama, and thence to San Francisco, stopping at intermediate ports. There was no hesitation in appropriating a large amount of money for carrying the mails. Congress did not consider it a subsidy, for the country received in return twenty times the value of the amount expended on these steam vessels. I myself commanded one of the mail steamers, and during three years carried about 36,000 passengers and \$82,000,000 in gold. But for that action on the part of Congress, no company could have afforded to start such expensive ships. The British would have absorbed all that trade, and the profits would have gone to Great Britain, not to the United States. The result of that action was, we held that line of steamers and others until the Pacific Railroad was built, and for once in our lives we kept a trade exclusively American in our own hands. There were no British ships in competition at that time, or we would have heard the same outcry against "subsidies" from American agents of foreign steam lines, who fear the competition of our countrymen.

Who can overestimate the importance of those steam lines to California? We gained actual possession of a great country, with its enormous wealth in minerals. Within a year a great city sprang from the barren hills as if raised by an enchanter's wand, and the wealth of California has made our Eastern cities grow and prosper in a manner that the world has seldom witnessed before.

Think what a vast amount of money has been paid to Englishmen in the last ten years merely for carrying passengers and produce across the Atlantic—at least one billion three hundred millions of dollars! The interest alone on that amount would have made us the greatest naval power in the world. But we are told the people do not desire the United States to be the greatest naval power, that we want "a small but efficient navy." Now, in the absolute sense of the word, a small Navy cannot be an effective one. A navy must be large in proportion to what will be required of it—protection to commerce in all quarters, and strong enough to take the initiative—and this is what we will have to look squarely in the face some time or other, perhaps when the sight may be the reverse of pleasant. It is all very well to boast of our corps of highly educated officers, so essential in case of war. I admit their excellence, but think we cannot do much with them if we have only a few torpedo-boats improvised from the towing craft about our large cities. When we do build ships we should be careful to take advantage of the numerous and costly experiments that have been made in Europe. There have been enough of them in the last fifteen years to satisfy anybody's curiosity. The English, French, Germans, Russians, Austrians, Italians, and Turks have each developed great ships of all kinds, and though some of these may not fulfill the expectations of their constructors, yet they are all built on well-tried principles. We cannot teach Europeans

anything in that direction, but by observing their experiments closely we ought to build as good vessels as they can. We have been crying for years, "Wait until Europe finishes her experiments with ships and guns, and then let us take advantage of her experience and build a better vessel than any abroad." Well, the Europeans have about finished their experiments, and are well provided with powerful vessels which seem to bid defiance to the elements, and with fast cruisers that can go round the world if necessary without using coal.

I paid a visit this year to West Point, where I desired still further to investigate the system of education which has so challenged general admiration and see wherein existed the superiority over the Naval Academy.

The Military Academy at West Point stands to-day, as it did in the time of Colonel Thayer, its most distinguished Superintendent, the foremost institution of its kind in the world. Like a house well built on a firm foundation it has stood the test of time, and to-day shows no signs of deterioration. Organized originally on a good system that has never been tampered with, the Military Academy has gone on and prospered, educating officers, who in time of need became commanders equal to any in the world.

Could the Confederates have obtained the services of all the graduates of West Point then living at the outbreak of our civil war, they would probably have gained their object; had we possessed them, we could have terminated the war in ninety days. Such is my opinion of West Point.

The discipline of the institution is excellent, and its rules as unbending as the laws of the Medes and Persians, yet the iron hand is concealed by a velvet glove, and there is nothing done to harass or mortify the cadets, who appreciate the benefits conferred upon them by the Government.

This condition of affairs differs widely from that which lately existed at the Naval Academy, an institution in which I have ever taken a warm interest, not only from having been its Superintendent for four years, but from the great benefit it has conferred on the Navy.

I attribute much of the success of the West Point Academy to the fact that its rules and regulations have had a character of permanence. They are never altered by the Superintendent, except after careful consultation with the Academic Board. The matter is then referred to the Secretary of War, who makes his decision after consulting with the inspector, so that no change is made without due deliberation, and there is little danger of the rules being tampered with. Under these circumstances and a Superintendent well suited to the place, which the War Department takes care to provide, the rules are so fixed that the institution moves on like clock-work. When occasion has occurred, as was the case a few years since, an appeal to the good sense and honorable feeling of the cadets seems to have remedied the evil.

There is another reason why discipline and harmony are better observed at West Point than at Annapolis. When a cadet enters West Point he feels sure that if he exerts himself properly he will at the end of his course receive a commission in the Army, and that his time and study will not be in vain, but will have fitted him for the career of his choice. He does not expect to go from the Academy into civil life with a military education and training, which, however excellent, have tended to make a civil career distasteful. Instead of feeling that his military education is finished, he sees ahead of him a continuance of studies if he would keep up with the progress of another profession. The result of

this knowledge naturally makes the West Point cadet a more cheerful fellow than the cadet midshipman, in whose class of sixty members only ten can hope to receive commissions in the Navy.

I think this state of affairs will account for the difficulty in maintaining discipline and harmony at Annapolis.

In my opinion, also, we are not always careful enough in appointing a Superintendent of the Naval Academy, who should not be chosen for some particular good quality he may possess, but for the many qualities required in so important a position. I think we should avoid in future the numerous changes which have heretofore been made by Superintendents without the authority of the Navy Department. Superintendents should refer everything of a serious nature to the Secretary of the Navy. No matter what may be the qualifications of an officer in command at Annapolis, he should understand that he is simply an executive, and directly responsible to a higher authority. At times the discipline of the Naval Academy has been extremely lax; then, again, it has been directed by too rigid a hand, evincing too much severity. A *juste milieu* is the best course, and while implicit obedience should be enforced, the hand of the Superintendent should, as far as possible, be parental. The errors of youth, where they are not criminal, should be dealt with as leniently as possible, and nothing should be done to degrade those who are to hold the honorable position of officers in the Navy. If you take away self-respect from a young man, the disgrace may cling to him for life. At the same time, I am an advocate for prompt dismissal from any military or naval institution where dishonorable conduct is proven, and a person so expelled should not be eligible for reinstatement under any circumstances. These remarks apply to myself as well as to any one else. I remember some events which occurred during my administration at the Naval Academy where unnecessary severity was dealt out, and I must say I always found the wholesome interference of the Department in these matters beneficial to the Academy.

I received every honor and courtesy while at West Point from the Superintendent and all the officers, and this was the more gratifying to me inasmuch as I am aware that the higher officers of the Army, men who have seen years of brilliant service, do not always receive at naval stations the honors to which they are entitled. I have known cases where even the General of the Army was received without the proper honors at a naval station. This may have arisen from misconstruing an Army regulation which had no reference to officers of high rank visiting military and naval posts, but the regulations should be liberally construed whenever an Army officer of high rank visits *any* of our naval stations, since there is no courtesy that should not be extended to our gallant brothers in arms who have performed such services for our country. Abroad every courtesy would be paid to them, and I beg leave to suggest that you will examine the Army and Navy Regulations relating to this matter, and the controversies that have taken place on the subject, and endeavor to have it so adjusted that there will be no difficulty in the future for either arm of the service to decide what is due in the way of honors and courtesies to the other.

ERICSSON'S TORPEDO.

Since writing the above remarks I have made some inquiries in relation to Ericsson's torpedo, and understand that Mr. Ericsson has so perfected it that in my opinion it is the most formidable torpedo now in ex-

istence. It can be operated against a vessel of war either in smooth or rough water, and a number of Ericsson's torpedo-boats would be a powerful adjunct in protecting our coasts and harbors. While the Government is paying attention to other torpedoes it should not neglect this most valuable invention. I am informed that Mr. Ericsson has planned a torpedo-vessel of good size which can keep the sea for ten consecutive days in any weather. Such vessels would go far towards breaking up any blockade of our coast. Ericsson's torpedo could be applied to any gun-boat we may build and even to large vessels.

I have the honor to remain, very respectfully, your obedient servant,

DAVID D. PORTER,

Admiral.

Hon. WILLIAM E. CHANDLER,

Secretary of the Navy.

No. 20.—BUREAU OF ORDNANCE.

BUREAU OF ORDNANCE, NAVY DEPARTMENT,
Washington City, November 1, 1883.

SIR: I have the honor to submit the annual report of this Bureau, and also to transmit estimates for the fiscal year ending June 30, 1885 :

1. Fuel, tools, material, and labor, small arms, and machine guns, and machine tools.....	\$453,210 00
2. General repairs, and a new iron powder-boat.....	15,800 00
3. Freight and miscellaneous expenses.....	3,000 00
4. Civil establishment at navy-yards.....	12,234 50
5. General expenses of the torpedo station, and purchase of a torpedo-boat, &c.....	105,000 00
6. To complete the ordnance outfit of the four new steel cruisers.....	449,027 00
7. To supply the ordnance outfits of the monitors Puritan, Terror, Mi- anonomoh, Amphitrite, and Monadnock.....	1,073,000 00
8. For modern guns, carriages, and ammunition for the rearmament of the Navy.....	599,400 00
Total.....	2,710,671 50

ORDNANCE.

The work of preparation of type guns of high power has progressed as fast as the very great difficulties encountered in procuring a proper quality of steel would admit.

Of the forgings ordered in the preceding fiscal year, only two sets have been received of quality suitable for making guns, and these have been taken in hand at the ordnance department of the Washington navy-yard, and pushed on as fast as possible. These guns are of 6-inch caliber, and will represent the hooped and the wire-wound systems. The former will be completed very shortly, and with it will be settled all questions of kind of powder, weight of charge and projectile for the Navy 6-inch guns.

The Bureau was not so fortunate with its orders placed in the United States for the manufacture of tubes for 8-inch guns, the steel-makers in our country not having thus far been able to deliver any forgings of this size. There is some prospect, however, of one being received ere long, and if it passes inspection more can probably be obtained.

In the meantime, with the assistance of a gun (designed by the late Commodore Jeffers) which the Bureau has lengthened to 30 calibers, very important progress has been made towards the determination of the character of powder suitable for use in the 6-inch and 8-inch calibers. Through the exertions of Lieut. Commander William M. Folger, in charge of the naval experimental battery, a class of powder has been about perfected, which gives very gratifying results in the gun above mentioned, and there seems no reason to doubt that it will be entirely successful and satisfactory in the bore of the regular service 6-inch gun behind 100 pounds of shot.

The pressures thus far obtained are very moderate (not exceeding 15.2 tons per square inch), and the velocities are high, 2,093 feet per second.

With such results already attained, the Bureau feels no apprehension concerning the powder for 6-inch and 8-inch guns, and this in itself is a great step toward success.

Standard drawings having been prepared for service high-power guns from 5-inch to 10½-inch caliber, the Bureau has been enabled to order forgings for the battery of the Chicago, and these are now being manufactured. If they prove to be of suitable quality, the machine finishing will be undertaken at once.

As was predicted, very considerable delay has been experienced in the production of forgings, and it was found necessary to order those for the 8-inch guns from abroad.

The attempt to obtain a suitable quality of high-grade wire for winding guns has been attended with very great difficulty and delay. Such wire has not been manufactured in this country, and offers great difficulties at the commencement. The matter is still pending, as the Bureau has not yet been able to find a firm which can certainly execute the work. It is believed, however, that progress can be made in this direction ere long.

The determination of a suitable model of carriage for the high-power guns has engaged a great part of the Bureau's attention, and several forms have been tried, all with good success. It is found possible to check the recoil of the 6-inch gun now at the experimental battery within about 14 inches, and that is less than would be judicious in service. There is no doubt of the production of suitable and strong carriages.

Experiments have been commenced with steel armor-piercing projectiles, both forged and unforged. Varying results have been obtained, the best being the performance of an unhammered cast-steel 6 inch shell, which passed through 10 inches of iron, backed by 20 inches of oak and 12 feet of earth, being upset only one-tenth of an inch. This was considered quite successful for a new branch of manufacture.

The Bureau has ordered two experimental compound armor plates (from two celebrated Sheffield firms), and will use them in grading and determining the qualities of armor-piercing projectiles.

At the ordnance department of the Washington navy-yard the Bureau has inaugurated a course of practical instruction for seamen gunners.

The course embraces the preparation of ammunition, mechanics, carpentry, and laboratory work, and it is hoped that it will be effective in increasing the usefulness of such of our young seamen as select the ordnance branch for a specialty.

MONITOR TURRETS.

A great deal of attention has been given to designs of monitor turrets, and several have been perfected which it is thought will unite the advantages of moderate size, sufficient interior space and convenience for manipulating the guns.

The carriages and internal gun fittings have been considerably advanced, and all these designs are in a sufficiently forward state for the present.

MACHINE GUNS.

The three Hotchkiss revolving cannon of 47^{mm} ordered last year have been recently received, and will be soon put afloat. Of course many more machine cannon are needed, as the number carried by ships of war is constantly increasing.

The Bureau has ordered from Mr. Hotchkiss two single-shot anti-torpedo guns as types of this class; one is to be a 6-pounder and one a 4-pounder. These pieces are coming prominently forward at present, and will probably form a very efficient part of the defense against automobile torpedoes, and will be much employed in engagements between ships, as they have high ballistic power. The piece (securely pivoted) is fired from the shoulder, no recoil being allowed.

Experiments with volley fire from Gatling guns (referred to in the last report) have been pursued, and considerable light has been thrown on the behavior of this gun at sea. More extended trial and constant practice is necessary in order to develop its true value afloat and assign them their proper place in naval armaments. A new and improved feed for this gun has lately been devised by the company.

SMALL-ARMS.

Magazine small-arms are still in a state of transition, and new models and devices are constantly coming forward. What is called the "left-hand movement" for loading and extracting is now being developed, and as it adapts itself to the easiest and most natural movements of the arms and hands, increased rapidity and facility of manipulation will result.

No military rifles of the kind are yet on the market, but it is probable that they will be soon. The Bureau is observing all changes and advances that take place in these matters.

ELECTRIC SEARCH LIGHTS.

During the year the Bureau has been able to order a few of the celebrated Mangin projectors from Messrs. Sautter, Lemonnier & Co., of Paris. One of these powerful lights (of the largest size) will be sent to the torpedo station for the purpose of experiment and instruction, and the others will be equipped with dynamos and engines and issued to the service. They are considered to be a powerful factor in defense against torpedoes, and are also very useful for a variety of military purposes on shipboard.

TORPEDOES.

Since the last report experiments have been continued at the Washington navy-yard on the rocket torpedo, and some experience has been gained.

In pursuance of the intent of an act of Congress passed during the last session, concerning a competitive trial of torpedoes adapted to naval warfare, notices were sent by this Bureau to the principal manufacturers of torpedoes both in this country and Europe. Replies from all of them are not yet in.

The importance of having a sufficient number of light and very swift boats from which to launch offensive torpedoes is well known to the Department, and it is suggested that Congress be again urged to appropriate for one to be purchased abroad, from one of the firms which has most experience in the building of such vessels.

THE TORPEDO STATION,

Under the energetic supervision of Capt. T. O. Selfridge, has given the usual amount of instruction to officers of the Navy, and the designing and construction of gun-cotton spar torpedoes for ships and boats

has been successfully accomplished. This material will soon be put afloat as far as the store of gun-cotton now on hand will allow.

Work on the plant for manufacturing gun-cotton has been pushed rapidly forward, through the exertions of Captain Selfridge, and there is every prospect of the Navy being able soon to manufacture its own gun-cotton. We cannot overestimate the importance of this most useful explosive, and the Department is to be congratulated upon having introduced its manufacture for military purposes into this country.

I am, sir, your obedient servant,

MONTGOMERY SICARD,

Chief of Bureau.

Hon. WM. E. CHANDLER,
Secretary of the Navy.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885,
by the Bureau of Ordnance, Navy Department.*

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884
SALARIES.		
Chief clerk (Rev. Stat., p. 70, sec. 416; act March 3, 1883, 23 Stat., p. 555).....	\$1,800 00	
Draftsman (Rev. Stat., p. 70, sec. 416; act March 3, 1883, 23 Stat., p. 555)	1,800 00	
One clerk of class three (Rev. Stat., p. 27, sec. 167; act March 3, 1883, 23 Stat., p. 555)	1,600 00	
One clerk of class two (Rev. Stat., p. 27, sec. 167; act March 3, 1883, 23 Stat., p. 555)	1,400 00	
One assistant messenger (same acts)	720 00	
One laborer (same acts)	660 00	
One clerk of class one (submitted)	1,200 00	
One clerk (submitted)	1,000 00	
	10,180 00	\$7,980 00
NOTE.—The elaboration of ordnance material which has taken place recently (and which is constantly going on), and the amount of correspondence that is incident to the prosecution of work on the new armaments has made an addition to the clerical force of the Bureau necessary. The recording of the press copy-books and the indexing of the correspondence is about two years behind.		
CONTINGENT.		
Stationery, books, and miscellaneous items (appropriated)	500 00	500 00
ORDNANCE.		
For procuring, producing, and preserving ordnance material; for the armament of ships; for fuel, tools, material, and labor to be used in the general work of the ordnance department; for furniture at magazines at the ordnance dock, New York, and at the naval experimental battery (Rev. Stat., p. 721, sec. 3666; appropriated, 23 Stat., p. 474)	\$180,000	
NOTE.—The above amount is considered necessary to meet the requirements named during the year.		
Towards the modern armament of the Navy—		
40 machine cannon of small caliber (submitted)	118,960	
20 Gatling guns (submitted)	33,000	
3,000 magazine rifles (submitted)	101,250	
NOTE.—A similar estimate to the above was made last year, but not appropriated for. The items are absolutely necessary for the proper armament of the Navy.		
For machine tools (submitted)	20,000	
	453,210	\$150,000
NOTE.—This amount is required to procure or manufacture and set up machinery in the ordnance department at the Washington navy-yard, to be used in finishing the several parts of the new steel guns, and also for making such repairs as will become necessary after the new armament is put in service. The money should be made available as soon as appropriated.		

Estimate of appropriations required for the service of the fiscal year, &c.—Continued.

Detailed objects of expenditure, and explanations.	Estimated amount which will be required for each detailed object of expenditure.	Amount appropriated for the current fiscal year ending June 30, 1884.
STEEL CRUISERS—ORDNANCE.		
To complete the ordnance outfit of the four new steel cruisers (submitted)...	\$449,027	
NOTE.—This amount should be made available as soon as appropriated.		
MONITORS—ORDNANCE.		
Amount required to supply the ordnance outfits of the monitors Poritan, Terror, Miantonomoh, Amphitrite, and Monadnock (submitted)	1,073,000	
NOTE.—No torpedo outfit is estimated for. If an automobile similar to the Whitehead should be used, \$100,000 additional would be necessary.		
STEEL RIFLED B. L. GUNS.		
To continue the manufacture of modern guns, carriages, and ammunition for the rearmament of the Navy (Rev. Stat., p. 721, sec. 3666; appropriated, 23 Stat., p. 474)	599,400	\$83,939 10
REPAIRS—ORDNANCE.		
For necessary repairs to ordnance buildings, magazines, gun-parks, boats, lighters, wharves, machinery, and other objects of the like character, including a new iron powder boat for use at the magazines, Ellis Island, New York, \$3,500 (Rev. Stat., p. 721, sec. 3666; appropriated, 23 Stat., p. 474)....	\$15,800 00	\$15,000 00
CONTINGENT.		
For miscellaneous items, viz: For freight to foreign and home stations; advertising, and auctioneer's fees; cartage and express charges; repairs to fire-engines; gas and water pipes; gas and water tax at magazines; toll, ferriage, foreign postage, and telegrams to and from the bureau (Rev. Stat., p. 721, sec. 3666; appropriated, 23 Stat., p. 474)	3,000 00	3,000 00
CIVIL ESTABLISHMENT.		
For the civil establishment at navy-yards (Rev. Stat., p. 721, sec. 3666; appropriated, 23 Stat., p. 474)	12,234 50	5,000 00
NOTE.—The increase asked for in the above item is to restore the former civil establishment under this bureau, except at the Washington navy-yard, where it increases the pay of the principal clerk to \$1,600, and provides for one clerk at \$1,200, and a writer at \$1,000; it also changes the pay of the clerk at Portsmouth and Mare Island navy-yards to \$1,150 each. No clerk or writer is asked for at Pensacola.		
TORPEDO CORPS.		
For labor, material, freight, and express charges; general repairs to grounds, buildings, wharves, &c.; boats, instruction, instruments, tools, furniture, experiments, and general torpedo outfits (Rev. Stat., p. 721, sec. 3666; appropriated (23 Stat., p. 474)	50,000 00	
For the purchase of a torpedo-boat, and the working drawings of the same (submitted)	55,000 00	
NOTE.—The purchase of a fast torpedo-boat from one of the leading builders of the world will furnish our people with a type and example of the most advanced form of construction, which is not now available.		
	105,000 00	50,000 00

Respectfully submitted.

BUREAU OF ORDNANCE, NAVY DEPARTMENT,
October 16, 1883.

MONTGOMERY SICARD,
Chief of Bureau.

MANUFACTURES AND PREPARATIONS AT THE NAVY-YARDS AND TORPEDO STATION FOR THE YEAR ENDING JUNE 30, 1883.

ARTICLES UNDER PROPORTION TO EACH GUN.

- 4 8-inch M. L. R. carriages, Ericsson.
- 12 8-inch M. L. R. sponges, bristle.
- 8 8-inch M. L. R. sponges, sheepskin.
- 20 8-inch M. L. R. sheepskin sponge-covers.
- 8 8-inch M. L. R. heads for sheepskin sponges.
- 2 8-inch M. L. R. impression instruments.
- 2 8-inch M. L. R. tackles, out.
- 2 8-inch M. L. R. tackles, in.
- 9 8-inch M. L. R. passing-boxes.
- 16 8-inch M. L. R. sponge-covers, canvas.
- 14 8-inch M. L. R. shell-tongs.
- 4 8-inch M. L. R. tackles, train.
- 3 8-inch M. L. R. rammers.
- 1 8-inch M. L. R. shell-gauge.
- 1 8-inch M. L. R. breeching.
- 65 8-inch M. L. R. canister-boxes.
- 30 8-inch M. L. R. canister.
- 8 8-inch M. L. R. pivot-bolts.
- 9 sets 8-inch M. L. R. pivot-clamps.
- 2 8-inch M. L. R. shell-extractors.
- 3 8-inch M. L. R. side-sight bars.
- 1 8-inch M. L. R. muzzle-bag.
- 8 8-inch M. L. R. clevis-bolts.
- 1 8-inch M. L. R. worm.
- 1 set 8 inch M. L. R. gun-gripes.
- 1 8-inch M. L. R. transporting chocks.
- 8 8-inch M. L. R. clevis-bolt covers.
- 12 8-inch M. L. R. cap-square wrenches.
- 1 XV-inch M. L. S. B. turret-sight.
- 3 XV-inch M. L. S. B. sponge-covers.
- 2 sets IX-inch M. L. S. B. gun-gripes.
- 27 IX-inch M. L. S. B. sheepskin sponge-covers.
- 2 IX-inch M. L. S. B. chocking-quoins.
- 30 IX-inch M. L. S. B. canvas sponge-cap.
- 31 IX-inch M. L. S. B. muzzle-bags.
- 21 IX-inch M. L. S. B. breechings.
- 8 IX-inch M. L. S. B. tackles, side, out.
- 10 IX-inch M. L. S. B. tackles, train, in.
- 23 VIII-inch M. L. S. B. sheepskin sponge-covers.
- 2 VIII-inch M. L. S. B. bristle-sponges.
- 3 VIII-inch M. L. S. B. muzzle-bags.
- 24 VIII-inch M. L. S. B. breechings,
- 1 6-inch B. L. R. S. short-recoil carriage.
- 2 6-inch B. L. R. S. carriage-wrenches.
- 157 6-inch B. L. R. S. shell.
- 1 set 6-inch B. L. R. S. deck-circles.
- 60 6-inch B. L. R. S. shell-boxes.
- 6 6-inch B. L. R. S. bristle sponges.
- 2 6-inch B. L. R. S. sheepskin sponges.
- 2 6-inch B. L. R. S. rammers.
- 2 6-inch B. L. R. S. impression instruments.
- 4 6-inch B. L. R. S. sponge-covers, sheepskin.
- 8 6-inch B. L. R. S. sponge-caps, canvas.
- 1 6-inch B. L. R. S. pivot bolt and sleeve.
- 1 80-pounder B. L. R. P. breeching.
- 160 80-pounder B. L. R. P. shell-boxes.
- 4 80-pounder B. L. R. P. sponges, bristle.
- 4 80-pounder B. L. R. P. sponges, sheepskin.
- 1 set 80-pounder B. L. R. P. gun-gripes.
- 8 80-pounder B. L. R. P. sponge-covers, sheepskin.
- 8 80-pounder B. L. R. P. sponge-caps, canvas.
- 1 80-pounder B. L. R. P. sponge-head.
- 30 60-pounder B. L. R. P. shell.
- 50 60-pounder B. L. R. P. shell-boxes.

- 6 60-pounder B. L. R. P. loading-scoops.
- 1 set 60-pounder B. L. R. P. gun-gripes.
- 10 60-pounder B. L. R. P. sheepskin sponges.
- 7 60-pounder B. L. R. P. bristle sponges.
- 4 60-pounder B. L. R. P. sheepskin sponge-covers.
- 4 60-pounder B. L. R. P. clevis-bolts.
- 6 60-pounder B. L. R. P. nose-plate wrenches.
- 5 60-pounder B. L. R. P. pivot-sockets.
- 12 60-pounder B. L. R. P. pivot-bolts.
- 8 30-pounder B. L. R. P. sheepskin sponge-covers.
- 16 30-pounder B. L. R. P. sponge-caps, canvas.
- 4 30-pounder B. L. R. P. breech-sights.
- 3 20-pounder B. L. R. P. sponge-covers, sheepskin.
- 438 20-pounder B. L. R. P. cartridge-bag followers.
- 2 20-pounder B. L. R. B. guns.
- 31 20-pounder B. L. R. P. sheepskin sponge-covers.
- 10 20-pounder B. L. R. P. sponge-caps, canvas.
- 2 20-pounder B. L. R. B. breechings.
- 4 20-pounder B. L. R. B. lashings.
- 11 20-pounder B. L. R. B. sponges, bristle, and rammers.
- 2 20-pounder B. L. R. B. sponges, sheepskin.
- 11 20-pounder B. L. R. B. side-sights.
- 6, 151 20-pounder B. L. R. B. shell-sabots.
- 4 20-pounder B. L. R. B. combination wrenches.
- 4 20-pounder B. L. R. B. nose-plate wrenches.
- 14 20-pounder B. L. R. B. drill-shot.
- 68 20-pounder B. L. R. B. shell.
- 4 20-pounder B. L. R. B. muzzle-bags.
- 28 20-pounder B. L. R. B. metal blocks.
- 4 20-pounder B. L. R. B. tackles.
- 20 lock laniards.
- 161 port laniards and bridles.
- 16 breast-lashings.
- 10 wash-deck chocks.
- 98 handspikes, ordinary.
- 1 handspike, roller, No. 2.
- 9 fire and division tubs.
- 42 friction-primer laniards.
- 1 spiral-pressure gauge.

HOWITZERS, MACHINE-GUNS, EQUIPMENTS, ETC.

- 3 3-inch B. L. H. of 500 pounds.
- 7 3-inch B. L. H. of 350 pounds.
- 15 3-inch B. L. H. boat-carriages.
- 7 3-inch B. L. H. field-carriages.
- 399 3-inch B. L. H. shell.
- 333 3-inch B. L. H. shrapnel.
- 1, 154 3-inch B. L. H. shell-plugs.
- 110 3-inch B. L. H. shell-boxes.
- 605 lbs. 3-inch B. L. H. shrapnel balls.
- 686 3-inch B. L. H. shell-sabots.
- 7 3-inch B. L. H. dismounting-bars.
- 6 3-inch B. L. H. dismounting-straps.
- 2 3-inch B. L. H. sheepskin sponges.
- 12 3-inch B. L. H. bristle sponges.
- 2 3-inch B. L. H. sheepskin sponge-covers.
- 15 3-inch B. L. H. sponge-caps, canvas.
- 3 3-inch B. L. H. tackles.
- 2 3-inch B. L. H. train-ropes.
- 6 3-inch B. L. H. haversacks.
- 20 3-inch B. L. H. drill-shot.
- 26 3-inch B. L. H. wrenches, nose-plate.
- 2 3-inch B. L. H. wrenches, combination.
- 2 3-inch B. L. H. clevis-bolts.
- 2 3-inch B. L. H. transporting-bars.
- 24 3-inch B. L. H. pivot-clamps.
- 25 3-inch B. L. H. pivot-bolts.
- 10 3-inch B. L. H. elevating-screws.

- 12 3-inch B. L. H. elevating-screw pins.
- 28 3-inch B. L. H. check-ropes.
- 13 3-inch B. L. H. drag-ropes.
- 2 3-inch B. L. H. canvas covers.
- 12 3-inch B. L. H. breech-sights.
- 24 3-inch B. L. H. linchpins.
- 6 3-inch B. L. H. sponge-buckets.
- 14 3-inch B. L. H. field-carriage wheels.
- 1 3-inch B. L. H. shell and shrapnel gauge.
- 1 12-pounder H. dismounting-strap.
- 3 12-pounder L. sponge-caps, canvas.
- 16 12-pounder L. sheepskin sponge-covers.
- 2 Hotchkiss R. cannon-mounts.
- 4 Hotchkiss R. cannon-standards, iron.
- 1 Hotchkiss R. cannon emplacement.
- 2 Gatling-gun covers.
- 3 Gatling-gun deck ammunition boxes.
- 8 Gatling-gun tripods.
- 1 Gatling-gun caisson-box.
- 1 set boat-tracks.
- 34 deck-chocks, field and boat carriages.

SMALL-ARMS.

- 400 guards for single sticks.
- 1 revolver-frog.
- 100 haversacks.
- 308 gun-slugs.
- 1 target.
- 113 cartridge-boxes.
- 102 pistol-frogs.

MAGAZINE STORES.

- 1,695 8-inch M. L. R. cartridge-bags.
- 1,780 8-inch M. L. R. burster-bags.
- 1 8-inch M. L. R. cartridge-bag former.
- 3 sets 8-inch M. L. R. shell-loading tools.
- 180 VIII-inch M. L. S. B. cartridge-bags.
- 400 32-par. M. L. S. B. saluting charges.
- 490 32-par. M. L. S. B. cartridge-bags.
- 86 6-inch B. L. R. S. cartridge-bags.
- 10 6-inch B. L. R. S. cartridge-bags, 27 pounds.
- 10 6-inch B. L. R. S. cartridge-bags, 30 pounds.
- 15 6-inch B. L. R. S. cartridge-bags, 33 pounds.
- 50 6-inch B. L. R. S. cartridge-bags, 35 pounds.
- 188 80-pounder B. L. R. P. cartridge-bags.
- 754 60-pounder B. L. R. P. cartridge-bags.
- 60 20-pounder B. L. R. P. cartridge-bags.
- 5,455 20-pounder B. L. R. B. cartridge-bags.
- 1 20-pounder B. L. R. B. cartridge-bag former.
- 2,949 20-pounder B. L. R. B. saluting-charges.
- 1,608 3-inch B. L. H. cartridge-bags.
- 1,200 12-pounder L. cartridge-bags.
- 20 magazine-shirts.
- 28 pairs magazine-shoes.
- 3 magazine-screens.
- 1 cover for magazine-screen.
- 12 funnels for powder-scuttles.
- 12 powder-scuttles.
- 2 powder-chutes.
- 4 spanners for magazine hose.
- 75 N. M. S. fuzes, 3½", spherical.
- 746 N. M. S. fuzes, 5", spherical.
- 150 N. M. S. fuzes, 7", spherical.
- 479 N. M. S. fuzes, 10", spherical.
- 149 N. M. S. fuzes, 15", spherical.
- 490 N. M. S. fuzes, 20", spherical.
- 5,959 N. M. S. fuze-cases.
- 1,960 N. M. S. fuzes.
- 880 N. M. S. fuzes, 5", rifle.
- 267 N. M. S. fuzes, 10", rifle.
- 215 N. M. S. fuzes, 15", rifle.

- 102 N. M. S. fuzes, 20'', rifle.
- 542 N. M. S. fuzes.
- 1,128 N. M. S. fuze-igniters.
- 644 N. M. S. fuze-stocks, rifle.
- 2,662 N. M. S. fuze-magazines.
- 1,552 fuzes, Boxer.
- 843 fuzes, Boxer, cases.
- 677 fuzes, Boxer, stocks.
- 1,174 fuzes, Bormann.
- 3,650 magazines, Schenkl fuze.
- 1,069 fuzes, adapters for.
- 20 Boxer fuze-cutters.
- 2,100 primers, quill friction.
- 901 primers, steel, vent-closing.
- 8,098 primers, steel, vent-closing tubes.
- 36 reloading tools for steel vent-closing primers.
- 24 pickers for steel vent-closing primers.
- 2 reamers for steel vent-closing primers.
- 21 gauges for steel vent-closing primers.
- 13 torpedo-rockets.

MISCELLANEOUS.

- 2 8-inch M. L. R. rail-chocks.
- 4 8-inch M. L. R. securing-chocks.
- 27 8-inch M. L. R. canister tops and bottoms.
- 2 8-inch M. L. R. cranks for carriage.
- 1 8-inch M. L. R. core-box and shell-pattern.
- 2 8-inch M. L. R. shot and shell calipers.
- 4 8-inch M. L. R. eyes and sockets.
- 100 XV-inch M. L. S. B. selvagees.
- 1 6-inch B. L. R. L. spring firing-attachment.
- 1 set 6-inch B. L. R. S. sponge-patterns.
- 112 6-inch B. L. R. S. deck-circle screws.
- 1 6-inch B. L. R. S. stem.
- 18 6-inch B. L. R. S. shell-castings.
- 1 6-inch B. L. R. S. loading-scoop.
- 2 6-inch B. L. R. S. trunnion-rings.
- 1 6-inch B. L. R. S. port-sill pivot-shackle.
- 1 6-inch B. L. R. S. die and punch for grommett.
- 2 6-inch B. L. R. S. gas-checks.
- 2 6-inch B. L. R. S. gun-patches.
- 2 80-pounder B. L. R. P triggers.
- 2 80-pounder B. L. R. P hammers, firing-attachment.
- 3 80-pounder B. L. R. P. tray-latches.
- 1 80-pounder B. L. R. P. loading-scoop.
- 1 80-pounder B. L. R. P. die and punch for grommet.
- 2 sets 80-pounder B. L. R. P. cartridge-bag patterns.
- 1 60-pounder B. L. R. P. bumper-plate.
- 4 60-pounder B. L. R. P. tray-hinge screws.
- 2 60-pounder B. L. R. P. hand-grip screws.
- 13 60-pounder B. L. R. P. eye-bolts.
- 1 60-pounder B. L. R. P. gas-check.
- 2 20 pounder B. L. R. P. gas-checks.
- 6 20-pounder B. L. R. B. elevating-screw pins.
- 4 20-pounder B. L. R. B. hook-ropes.
- 7 20-pounder B. L. R. B. Broadwell rings.
- 2 20-pounder B. L. R. B. collar-latches.
- 2 sets 20-pounder B. L. R. B. cartridge-bag patterns
- 24 20-pounder B. L. R. B. springs.
- 1 3-inch B. L. H. wiper-pouch.
- 1 3-inch B. L. H. loading-pouch.
- 4 3-inch B. L. H. shoes for boat-carriage.
- 6 Gatling-gun crank catch-springs.
- 2 stationery boxes.
- 110 hooks for fire-buckets.
- 10 brackets for passing scuttle-wrenches.
- 102 pounds lock-laniard stuff.
- 1 gun-cover.
- 2 target-plates, iron.
- 180 cartridge-box blocks.

- 8 target-frames.
- 12 shell stands and braces.
- 20 pouches for Lee magazines.
- 51 fire-bucket laniards.
- 1 signal-ball.
- 1 dismounting-bar.
- 6 division supply-boxes.
- 50 loading-marks.
- 4 cold-chisels.
- 2 wrenches.
- 6 straps for magazine cans.
- 36 swabs.
- 12 pins for roller-handspikes.
- 1 tarpaulin.
- 7 sets fuse taps and plates.
- 500 disks, copper, for pressure-gauge.
- 200 sinkers, deep-sea.
- 6 armorers' tool-chests.
- 7 sets armorers' tools.
- 14 cup gas-check boxes.
- 1 model of wire-wound gun.
- 4 wrenches, fuse-plate.
- 1 telescopic bore-searcher.
- 2 blue-printing apparatus.
- 520 buttons and swivels.
- 3 metal blocks.
- 1 stand for rigging-machine.
- 12 bolts, nuts, and washers.
- 4 iron hooks.
- 25 hooks, drag-rope.
- 6 iron wedges.
- 2 shot-cranes.
- 44 lag-bolts.
- 8 bolts.
- 12 desk-trays.
- 1 envelope-case.
- 1 case for blanks.
- 1 set book-shelves.
- 2 awnings.
- 2 desk-tops.
- 1 drawing-table.
- 1 drawing-board.
- 2 cases.
- 1 annealing furnace.
- 1 model of water-engine.
- 2 calipers.
- 1 anchor-stamp.
- 100 hooks, friction-primer laniard.
- Repairs to stores on hand.
- Repairs to stores for vessels fitting.
- Repairs to stores for vessels in commission.
- Repairs to buildings, wharves, shot-beds, gun skids, &c.
- Guarding public property,

TORPEDOES.

- 25 gun-cotton torpedoes.
- 100 saluting-cans.
- 1 rheostat.
- 1 telephone connection.
- 17 spar-leading wires, ship.
- 329 pounds nitro glycerine.
- 50 pounds dynamite.
- 315 pounds explosive gelatine.
- 680 electric cannon-primers.
- 817 D. E. fuses.
- 1,063 D. E. igniters.
- 83 D. E. igniters, station.
- 10 fuses, station.
- 2 immersion batteries.
- 25 gun-cotton detonators.
- 139 gravity battery zincs.

12 wrenches.
 1 electric-light hood.
 36 electrodes.
 36 terminals.
 33 binding-screws.
 188 pieces rubber tubing.
 2 electric-light motors.
 3 gun-cotton torpedo-spars.
 1 electric search-light mechanism.
 192 pieces emery cloth.
 Erection of gun-cotton machinery.
 Repairs to chronographs.
 Repairs to deteriorated stores on hand.
 Repairs to deteriorated stores from ships.
 Repairs to tools, &c.
 Repairs to boats, engines, boilers, &c.
 Repairs to buildings, wharves, &c.
 Guarding public property.
 Experimental work of all kinds: Explosives, fuses, electric lights and apparatus, electric batteries, torpedoes, shunt, electricity, galvanometers, disintegrated gun-cotton, dynamo machines.

*LIST OF VESSELS FOR WHICH WORK HAS BEEN PERFORMED DURING
THE YEAR ENDING JUNE 30, 1883.*

Adams.	Independence.	New Hampshire.	Saint Louis.
Alaska.	Intrepid.	Nipsic.	Swatara.
Alert.	Jamestown.	Ohio.	Tallapoosa.
Ashuelot.	Jason.	Palos.	Tennessee.
Colorado.	Juniata.	Passaic.	Trenton.
Constellation.	Kearsarge.	Pinta.	Vandalia.
Constitution.	Marion.	Portsmouth.	Wachusett.
Dale.	Miantonomoh.	Powhatan.	Wyoming.
Despatch.	Minnesota.	Richmond.	Yantic.
Dictator.	Monocacy.	Saratoga.	
Enterprise.	Montauk.	Saugus.	
Hartford.	Nantucket.	Shenandoah.	

TORPEDO STATION.

OFFICERS ATTACHED TO STATION, 1883.

Capt. T. O. Selfridge, inspector of ordnance, in charge.
 Lieut. Commander T. F. Jewell, assistant inspector of ordnance and instructor in electricity.
 Lieut. Commander J. S. Newell, assistant inspector of ordnance and instructor in torpedoes.
 Lieut. W. Maynard, assistant inspector of ordnance and assistant instructor in electricity.
 Lieut. T. C. McLean, assistant inspector of ordnance and instructor in fuses.
 Lieut. J. L. Hunsicker, assistant to instructor in torpedoes and in charge of records, drawings, and library.
 Mr. J. Fleming White, chemist and instructor in chemistry and explosives.
 Passed assistant paymaster, Stephen Rand, jr.
 Surgeon, J. B. Parker.
 Gunner, J. R. Grainger.

The following officers reported April 30 :

For attendance on the course of instruction.

Commanders W. B. Hoff, C. E. Clarke, R. P. Leary, D. W. Mullan.

For instruction.

Lieutenant-Commanders Socrates Hubbard and M. B. Buford; Lieuts. C. H. Judd, W. I. Moore, A. B. H. Lillie, Albert Ross, W. H. Reeder, N. H. Barnes, James D. Adams, C. A. Adams, F. Singer, C. K. Curtis, John Hubbard, M. E. Hall, H. R. Tyler, T. G. C. Salter, H. C. T. Nye; Ensigns Lovell K. Reynolds, P. V. Lansdale, Allan G. Rogers, Louis Duncan, Thos. A. Parke.

The course of instruction embraced the months of May, June, and July.

The attendance of officers for instruction was from the 9.30 a. m. boat to the 2.30 p. m. boat.

The days were divided into two periods: First period, from 9.45 a. m. to 11.45 a. m. Second period, from 12.15 p. m. to 2.15 p. m.

The lectures and practical exercises as per schedule were posted daily in the officers' room and on the ferry launch.

The officers under instruction were required to have ready each Monday morning for the examination of the commanding officer a careful and neatly written *résumé* of the lectures of the previous week, giving detailed drawings, descriptions, and explanations of such things as were specially designated by the instructors. Blank books were furnished for this purpose. These books were examined by the instructors, all errors noted, and returned to the commanding officer.

As a general rule for practical exercises the officers were divided into three parts.

At the close of the course of instruction an examination was held before the Board of Visitors, to whom the books of the officers under instruction were submitted.

The following lectures were delivered before the class:

ELECTRICITY.

1. Introductory: Elementary mechanical principals and fundamental physical laws.

2. Frictional electricity: electrical attractions and repulsions, theory of potential, electro static induction; conduction and distribution of electricity; accumulators and condensers.

3. Magnetism: Magnetic attractions and repulsions; magnetic field; magnetic potential; terrestrial magnetism; diamagnetism.

4. Current electricity: Simple voltaic cell; electro-motive force; Ohm's law; contact and chemical theories.

5. Current electricity: Resistance; specific resistance; circuits; polarization; earth plates and connections; insulating materials.

6. Current electricity: Laws relating to currents, thermal, magnetic, mechanical, &c.

7. Voltaic batteries: Typical forms; arrangement and care of batteries; thermo-electricity.

8. Voltaic batteries: Typical forms; arrangement and care of batteries; thermo-electricity.

9. Electro-dynamics: Attraction and repulsion of currents; mutual

actions between currents and magnets; Ampère's theory of magnetism; electro-magnets.

10. Electro-dynamics: Force on a current in a field; electro-dynamic induction.

11. Service firing machines: Earlier forms of M. E. and D. E. machines; development of D. E. machines; Farmer's A and C machines and firing key.

12. Electrical measurements: Galvanometers; electro-dynamometers; resistance coils, &c.

13. Electrical measurements: Measurement of resistance of conductors; of insulation.

14. Electrical measurements: Measurement of E. M. F. and internal resistance of batteries; comparison of electro-motive forces; use of electro-meter and reflecting galvanometer; capacity.

15. Electrical fuses: Theory; principle of construction and choice of materials.

16. Electrical fuses: Figure of merit; measurement of resistance hot and strength of current to fire; arrangement of circuits.

17, 18. Modern D. E. machines: Principal typical machines; Gramme; Siemens, Brush, Edison.

19. Electric lighting: Arc and incandescent lamps; arrangement of circuit.

20. Motors and electrical transmission of power; general principles; search-light apparatus.

21. Secondary batteries: Laws of electrolysis; theory of charge and discharge.

22. Electro-metallurgy: Electro deposition of metals.

23. Application of electricity: Telegraphs; telephones; electric bells; relays; Converse apparatus.

24, 25. Supplementary.

EXPLOSIVES.

1. Introduction to chemistry and explosives.

2. Ignition and detonation.

3. Explosive mixtures and explosive compounds.

4. Preparation of material for gunpowder.

5, 6. Manufacture of gunpowder.

7. Properties, testing, and firing of gunpowder.

8. Electrical chemistry.

9. Electroplating and electrotyping.

10. Nitro-glycerine: Preparation of raw material.

11. Nitro-glycerine: Theory of manufacture and explosion.

12. Nitro-glycerine, manufacture of.

13. Nitro-glycerine compounds.

14. Exploding nitro-glycerine and its compounds.

15. Gun-cotton: History, theory, preparation of raw material.

16. Gun-cotton: Manufacture at Waltham Abbey.

17. Gun-cotton: Testing, storing, handling,

18. Gun-cotton, exploding, and application of.

19. Fulminates, fuse compounds, and other explosives.

20. Picrate powder: Liquid carbonic acid for movable torpedoes.

21. Metallurgy.

TORPEDOES.

1. Early inventions; efforts of Bushnel, Fulton, and Colt.

2. Torpedoes used during the Crimean war and the rebellion.

3. History of the spar torpedo, and lessons derived from its use.
4. Spar-torpedo cases; methods of exploding and material necessary for.
5. Torpedo spars and their attachments for ships.
6. Torpedo spars and their attachments for monitors, tugs, and boats.
7. Torpedo outfits for cruising vessels.
- 8, 9. Electrical apparatus for ships, to include Trenton's apparatus.
10. Circuit-closers for spar torpedoes; improvised torpedoes; specially constructed United States vessels.
11. Foreign spar torpedoes; foreign torpedo boats and vessels.
12. Fast torpedo launches.
13. Towing torpedoes experimented with at the station.
- 14, 15. Service towing torpedoes.
- 16, 17, 18. Automatic movable torpedoes of the Whitehead type.
- 19, 20. Movable torpedoes of the Lay type.
21. Mechanically controlled steam-launches for torpedo purposes.
22. Submarine boats, projectiles, and rockets.
23. Defensive torpedoes; classification and description.
24. Description of attachments; changes necessary at various depths; radius of destructive effect.
25. Methods of determining the position of a vessel with reference to any torpedo or group of torpedoes, and judgment firing.
26. Various systems and methods of harbor defense with torpedoes.
27. Defense against offensive torpedoes.
28. Clearing channels of torpedoes and obstructions.
29. Clearing channels of torpedoes and obstructions.
30. Supplementary.

The following practical exercises were also performed by the class in

ELECTRICITY :

1. Setting up batteries and grouping cells.
2. Measurement of currents.
3. Measurements of resistances.
4. Measurement of E. M. F. of batteries.
5. Measurement of internal resistance of batteries.
6. Comparison of E. M. F. with standard cell.
7. Measurement of fuses.
- 8, 9. Dynamo machines, electric lamps, motors, and electro-dynamometer; care and use of same for lighting purposes.
10. Measurement of E. M. F. and resistance of machines.
11. Efficiency of machines.
12. Exercises in the use of shunts; calculation of conditions to operate electrically-controlled boat with dynamo machine.
13. Insulation resistance; capacity of cables and condensers.
14. Setting up Converse shutter, and other apparatus for the explosion of mines. Improvised apparatus.

EXPLOSIVES.

1. Electro deposition of metals.
2. Manufacture of nitro-glycerine.
3. Manufacture of dynamite.
4. Manufacture of explosive gelatine.
5. Explosion of large charges of high explosives, and preparation of detonators for the same, filling cases, &c.

TORPEDOES.

1. In lecture-room with machines and firing apparatus.
2. Firing boat torpedo.
3. Firing boat gun-cotton torpedo.
5. Detect faults with machines in lecture-room.
6. Torpedoes improvised and fired from launches.
7. Booms destroyed with dynamite.
8. Working Lay boat.
9. Planting defensive torpedoes and firing them, using circuit-closers, Converse's indicator and shutter apparatus.
10. Working mechanically-controlled steam-launch, and exercising at counter mining.
11. Defense against torpedo attack.
12. Handling engines and boilers of torpedo launches.

Practical instruction in firing ship torpedoes and in the use of the Harvey torpedo against stationary and moving targets was necessarily omitted, owing to the absence of the *Nina*, which vessel was ordered to New York in the spring for repairs, and the inability to procure another vessel for these exercises.

EXPLOSIVES.

1. Manufacture of service D. E. igniters.
2. Manufacture of service D. E. fuses.
3. Manufacture of M. E. and F. igniters.
4. Detecting and correcting faults in fuses and igniters.
5. Improvising fuses.
6. Manufacture of gun-cotton detonators.

On the 4th of August the following gunners reported for instruction: Joseph Swift, John G. Foster, G. L. Albro, James M. Hogg, Andrew Harman, George Dunn, C. H. Venable, W. E. Webber, Patrick Lynch.

As the course was to cover but one month it was mainly practical and of a nature suited to the duties pertaining to this class of officers on shipboard.

The instruction in diving was given by an experienced diver, under the superintendence of an officer, as follows: In the implements, dress and signals used in diving, taking apart, cleaning and assembling the different parts of the apparatus used in diving, and in the necessary precautions to be observed when engaged in diving operations.

The instruction in explosives was of a very practical nature, and included the following subjects: General character of explosive substance; what constitutes an explosive compound and an explosive mixture; how explosive effect is produced; difference between combustion and detonation, and how the latter is produced; what explosives must be detonated in order to obtain the best results; value of detonation and the relative force of different explosives when detonated and when fired by ignition; making fulminate of mercury; methods of washing, storing, testing, transporting, and handling fulminates; care of fulminate detonators on shipboard; practical exercise in making fulminate detonators; drying detonators; testing when dry; care of detonators; value of fulminate of mercury as a detonating agent for high explosives.

Gunpowder: Influence of size and shape of grains and method of ignition on the effect produced; value of special shapes such as spherical, hexagonal, prismatic, &c.

Nitro-glycerine: A brief explanation of the manufacture; experi-

ments showing its properties; care of nitro-glycerine; storing, testing, washing if impure, freezing, thawing, transporting, exploding when liquid and when frozen; safety when frozen; uses of nitro-glycerine; practical exercises in exploding and handling; precautions to be observed; danger when exposed to shot.

Dynamite: Care of and preservation; storing, inspecting, testing, transporting; danger from exudation of nitro-glycerine; signs of decomposition; frequency of examination; effect of heat and cold; safety of dynamite over liquid nitro-glycerine; danger when exposed to shot; uses both above and below water; exploding soft and frozen dynamite.

A practical exercise was given in making and exploding dynamite.

Explosive gelatine: Manufacture, properties, storing, testing, inspecting, transporting; effect of heat and cold, decomposition, danger, uses, exploding by Austrian detonator, both above and under water; practical exercise in making up and firing charges of explosive gelatine.

Gun-cotton: A brief explanation of its manufacture; different forms of gun-cotton in use, viz, long staple, granulated, disks, slabs, tape, &c.; its importance in warfare and extensive use in other countries; care and preservation of wet gun-cotton; storing, inspecting, testing; how treated if moldy or shows signs of decomposition; sawing, drilling, turning into special shapes; effect of heat and cold on wet gun-cotton; how carried on shipboard; care of gun-cotton on ships; safety of wet gun-cotton over all other explosives when exposed to fire, shock, blows from bullets, projectiles, &c.; uses of wet gun-cotton, exploding; practical exercises in making up and firing charges of gun-cotton to show how it should be used to destroy guns, blow down embankments, remove rocks, &c., both above and below water; also how it should be used to cut off spars, &c.

Dry gun-cotton for primers: How dried; care in drying, storing, transporting, inspecting, and testing dry gun-cotton; signs of decomposition; how to stop it; packing dry gun-cotton to go on shipboard; care while on board; uses of dry gun-cotton; safety compared to gun-powder.

Practical exercises in clearing obstructions from a channel by means of high explosions.

The instruction in electricity was as follows:

Simple description and explanation of the more common effects produced by electricity.

Explanation of the meaning of technical terms in general use.

The sources of electricity; conductors and insulators, circuits, electro-motive force; resistance; a brief explanation of electrical units, with their mutual relations; Ohm's law.

The typical forms of voltaic batteries, with practical rules for setting them up, keeping in order, and grouping for best effects.

Polarization (of cells and earth plates).

Magnets and magnetism: Permanent and electro-magnets; principle of induction; electrical magnetic and electro-magnetic; relations between electricity and magnetism; construction and care of service dynamos, electric lights, and projectors; electric bells and their circuits, with hints and precautions in regard to them; simple tests for continuity of circuits and for detecting leaks in insulated wires; storage batteries; practical exercises in setting up and connecting batteries, mixing solutions, amalgamating zines, &c.

The instruction in fuse-making consisted in requiring each member of the class to construct igniters, fuses, electric gun-primers, M. E. igniters and fulminate of mercury detonaters.

During all practical exercises igniters and fuses of their own manufacture, as well as electric gun-primers, were used.

The instruction in torpedoes consisted in a complete description of all articles included in the torpedo outfits of vessels for the use of gun-powder and gun-cotton, the construction, application, use, care, preservation, transportation, and repair of all such articles.

Practical exercises were continued until all of the members of the class became expert in fitting and exploding service and improvised torpedoes using the various kinds of firing apparatus now supplied, at different times, both with the service machines and batteries.

Lieutenant-Commander Newell was detailed to have general charge of the instruction. Instruction in torpedoes, torpedo outfits, &c., was given by Lieutenant-Commander Newell, in electricity by Lieutenant Maynard, in explosives by Professor White (chemist), and Lieutenant McLean had charge of the instruction in fuse-making and diving.

It is my agreeable duty to speak in the highest terms of the interest and diligence manifested by the class of 1883 in the studies taught them during their course. While it was equally a pleasure to speak in my last report of the commendable zeal and advancement of the class of 1882, I am obliged acknowledge that the present class graduated with higher marks of excellence than any previous one under my command.

The course necessarily embraces a wide range of subjects, and can only be mastered by a close application to text books outside of the lecture room.

More special attention has been given during the past season to instruction in the use of the electric lights, both as torpedo search-lights and the illumination of confined areas. Each member of the class was called upon to measure the candle power of the arc light, to calculate the H. P. developed, and to practice with the search-lights.

ELECTRICITY.

The large dynamo, capable of supplying two lights of 15,000 candle power, ordered by the Bureau of the Brush Electric Company of Cleveland, was received last spring. I regret to say that the machine entirely failed to develop the current guaranteed, and was accordingly returned. The resources of the Brush Company have been so much taken up that they have neglected to exert themselves in fulfilling their contracts in regard to this machine. But I have lately been assured that all the difficulties have been overcome, and that it will shortly be ready for another trial. The machine was run by a Westinghouse engine of about 20 H. P., coupled directly to the armature shaft.

There has lately been received at the station from L. Sautter Lemonnier & Co., of Paris, a Mangin reflector of 36 inches, with a non-automatic lamp. There being no place to exhibit to advantage this very large instrument, I have had it placed on a pedestal near the boat-house, with a removable house over it, and it is now in a convenient place for experiments. The beam thrown, though very narrow, is the most powerful of any that have been experimented with at the station.

The electro-magnets of McLean's apparatus, for starting, stopping, and backing the engine of a steam-launch, and for steering the boat, have an average resistance of 20 ohms. The resistance of the cable conveying the current to the boat is 17.5 ohms, and that of the two electric magnets of the transmitter of Haight's apparatus 20.5 ohms. The total resistance is therefore 58 ohms.

The current required to operate the function magnets, under ordinary

circumstances, is 1.1 ampère. No series dynamo at this station will give so great a current through a resistance of 58 ohms.

To construct magnets that could be operated by a smaller current would involve a material increase of resistance, while to make them of larger wire, which would require more current, would not be advisable so long as the other resistances in the circuit, remain as large as they now are. The magnets of the step-by-step apparatus could doubtless be made of less resistance, but the resistance of the cable cannot be reduced, it being already of as large wire as is compatible with the proper handling of the boat.

The Edison Company very kindly loaned this station last summer one of their Z dynamos. It was very acceptable in the instruction of the class in this system of incandescent lighting, which has already been partially adopted in the Navy, and I add some remarks and measurements of this dynamo, made by Lieutenant-Commander Jewell:

The circuit was composed of 44 B lamps, arranged two in series, and 12 A lamps (the whole being equivalent to 34 A lamps), with the necessary leads and instruments for measurement.

The current in the main circuit was measured by one of Ayrton & Perry's anemeters, whose constant has been carefully determined both experimentally and by comparison with the standard galvanometer.

The difference of potential at the terminals of the machine was measured by a Helmholtz-Gauguin galvanometer of known constant, a resistance of 6,000 ohms being interposed in its circuit.

The current in the lamp and the difference of potential at its terminals were measured by two tangent galvanometers (Bradley's), whose constants were determined by comparison with the standard. A resistance of 5,000 ohms was placed in the circuit of the potential galvanometer. The three galvanometers were on pillars in the electrical laboratory, sufficiently removed from each other to prevent mutual influence.

The power applied to driving the dynamo was measured by the power dynamometer described in the report of the commanding officer of this station for 1882 (see report Secretary of the Navy, 1882, vol. III), proper allowance being made for the friction of the dynamometer and the slip of its belt. The photometer was a modified Ritchie. The standard of light was a Carcel lamp, burning colza oil. This lamp is usually rated as equivalent to 9.5 candles, but comparison with the standard English candle after the experiment gave, as the mean of a number of observations, 7.5 candles.

The experiments were conducted as follows: The regulating resistance was adjusted, once for all, so that the lamps gave their candle power as judged by the eye. Five of the A lamps, varying in resistance between 179 and 210 ohms (cold), were then carried successively to the photometer and balanced against the standard lamp. When the balance was obtained the readings of the various galvanometers, the indications of the power dynamometer and the revolutions of the dynamo were noted, the results being given in the following table.

After a run of 45 minutes the resistance of the armature of the machine was 0.145 ohm; that of the field magnets, including the regulating resistance, 50.2 ohms. The currents and energy in the field and armature coils, as given below, were calculated from these resistances and the measured differences of potential at the terminals of the machine.

Results of measurements of "Z" dynamo machine, made at the United States naval torpedo station, October 19, 1883.

Number of experiment.	1.	2.	3.	4.	5.
Revolutions of machine	954	1, 016	1, 031	1, 045	1, 028
Current in armature ampères..	31. 5	32. 1	32. 1	32. 4	32. 7
Current in field magnets do....	1. 87	1. 89	1. 90	1. 92	1. 93
Current in external circuit..... do....	29. 6	30. 2	30. 2	30. 5	30. 8
Diff. of potential at terminals of machine volts.	93. 9	94. 8	95. 6	96. 4	97. 0
Electric energy in armature..... H. P..	. 193	. 200	. 200	. 204	. 208
Electric energy in field do....	. 236	. 240	. 244	. 248	. 251
Electric energy in external circuit..... do....	3. 73	3. 84	3. 87	3. 94	4. 00
Total electrical energy..... do....	4. 16	4. 28	4. 31	4. 39	4. 46
Power applied to driving do....	4. 67	4. 72	5. 04	5. 11	5. 02
Percentage of applied power appearing as electrical energy	89. 1	90. 6	85. 6	86. 0	88. 8

Results of measurements of "Z" dynamo machine, made at the United States naval torpedo station, October 19, 1883—Continued.

Number of experiment.	1.	2.	3.	4.	5.
Percentage of total electrical energy appearing in external circuit	89.7	89.7	89.7	89.7	89.7
Percentage of applied power appearing in external circuit	79.9	81.3	76.8	78.9	79.7
Resistance of lamp (cold) .....ohms..	184.2	179.0	187.9	202.1	210.0
Diff. of potential at lamp .....volts..	92.2	93.1	94.2	94.8	95.3
Current in lamp .....ampères..	.84	.84	.82	.79	.75
Energy in lamp .....H. P..	.104	.105	.104	.100	.096
Candle power	15.92	15.92	16.65	15.92	15.20
Number of candles per H. P	153.4	152.0	160.9	158.7	158.6
Number of 16-candle lamps per H. P.....	9.59	9.50	10.06	9.92	9.92

The following table exhibits the results of experiments with the Edison machine connected with a Brush focusing arc lamp:

Number of experiment.	1.	2.	3.	4.
Revolutions of machine.....	950	960	960	960
Regulating resistance in circuit of field-magnet coils.ohms..	0.0	29.87	29.87	29.87
Current.....ampères..	48.7	49.1	46.2	47.8
Difference of potential at terminals of machine.....volts..	65.7	65.8	72.1	77.9
Difference of potential at terminals of lamp.....do....	50.5	50.5	50.5	55.3
Resistance of arc .....ohms..	1.04	1.03	1.09	1.16
Interposed resistance.....do....	0.22	0.22	0.385	0.385
Total external resistance.....	1.35	1.34	1.56	1.63
Candle power of arc.....	8,200	17,170	6,802	14,635

The illuminating power, as measured, varied largely on account of the shifting of the arc from side to side of the carbons. The carbons were in line, and the measurements were made as nearly as possible when the arc was in the axis of the carbons.

It was found necessary to interpose a resistance in the external circuit in order that the field-magnet coils should obtain their proper proportion of the current. Without this interposed resistance, when the carbons are in contact, the resistance of the external circuit is so small compared to that of the field magnets that the latter are but feebly excited, and the electromotive force developed is correspondingly low. With the resistance interposed, however, the lamp established the arc without difficulty. The feed was somewhat irregular, owing to the construction of the lamp, which is not adapted to a dynamo of this class.

The machine has also been tried with a hand-regulating arc lamp, the same difficulties being encountered. There is no doubt, however, that a machine of this type could be constructed with a compound winding to give a powerful arc light.

EXPLOSIVES.

Much interest has been taken at the station in the compound known as explosive gelatine, not only because of its enormous power (exceeding nitro-glycerine), but because of its safety in handling (if not decomposed), from its gummy, plastic nature.

But so far all our samples have shown signs of decomposing in from one to five months. It had been thought that this might arise from the presence of free acid in the collodion cotton employed in the manufacture. Accordingly, last year, this cotton was cleansed by repeated washings till it showed no signs of acid reaction.

Some of the samples thus treated did develop increased stability, while others decomposed enough quickly to shake our confidence that we had yet arrived at any safe solution. It has been the custom for the purpose of more quickly dissolving the cotton in nitro-glycerine to carry on the process at a temperature of above 150° F. Professor White, reasoning from the well-known fact that gun-cotton will decompose at a temperature above 150° F., was led to believe that the difficulty had

been of a too high temperature in the manufacture. Accordingly, he has prepared some samples dissolved at a temperature of 100° F., and so far the result bears out his theory of the cause of decomposition. The following remarks by Mr. White give the subject more in detail:

Three hundred and thirty pounds were made during the last year. The nitro-glycerine was carefully made from the best material, and thoroughly washed and cleaned.

The soluble gun-cotton was purified by soaking in a dilute solution of sal-soda and then thoroughly washed and dried; 240 pounds explosive gelatine were made from this pure material by the methods given in last year's report.

Although this gelatine has better keeping qualities than that made from the unwashed cotton, yet it slowly gives off acid fumes and shows exudation of nitro-glycerine.

Sixty pounds were made by the same method, but with the following composition:

	Per cent.
Nitro-glycerine	86.40
Soluble gun-cotton.....	9.60
Camphor	4.00
	100.00

This gelatine was much firmer than that which contained a less amount of soluble gun-cotton, and shows no exudation of nitro-glycerine, but slowly gives off acid fumes.

The method used in the manufacture of gelatine at this station is certainly at fault.

The best English gun-cotton will begin to decompose in from fifteen to twenty minutes if exposed to a temperature of 65° C. = 150° F. The soluble variety used at this station for the manufacture of explosive gelatine, after being thoroughly washed, will only stand the above heat test for from twelve to fifteen minutes, which is very good for this variety of gun-cotton.

In the method formerly used the soluble gun-cotton was mixed with the nitro-glycerine, and the mass then exposed to a temperature of 70° to 80° C. = 158° to 176° F. for thirty minutes, which caused the gun-cotton to decompose before the gelatine was made. It was claimed that the gun-cotton would not dissolve in the nitro-glycerine at a lower temperature, but experience has shown that under certain conditions the gun-cotton will dissolve in the nitro-glycerine at a temperature of 38° C. = 100° F. The camphor must be completely dissolved and the nitro-glycerine must be pure, perfectly dry, and have a temperature of 100° F. The soluble cotton must be perfectly dry, and have a temperature of 100° F. when added to the nitro-glycerine; the mixture must be kept at this temperature and rapidly stirred for one hour.

Thirty pounds were made by this method, and to the present time has shown no signs of decomposition or exudation of nitro-glycerine.

Twelve small samples were exposed to a temperature of 122° F. in the same way as described in report of last year. They continued to give off acid fumes for three months, and at the end of that time part of the gelatine exploded and so scattered the remaining samples that it was impossible to draw any conclusion except that the material was not safe at that temperature.

While no large amounts of explosive gelatine are made here, and it is not probable or desirable that any compound of a body so notoriously unstable as nitro-glycerine would be placed on our ships of war, its favorable characteristics as a torpedo explosive might make its use a necessity in time of war, and therefore the experiments have been carried out further than any immediate necessity requires, with the hope of making this compound sufficiently safe for employment in special cases.

GUN-COTTON.

I had hoped ere this to have been able to report to the Bureau the completion of the laboratory for the manufacture of gun-cotton, but delays in the delivery of machinery, and other unavoidable causes, have interfered with the work, and I expect by December 1 the apparatus will be in running order.

Professor White and Mr. Angstrom, who were sent abroad by the Bureau to examine into the manufacture of gun-cotton in England, returned in the spring with much valuable information and plans of ma-

chinery employed. Waltham Abbey and Stowmarket were visited, and they received every politeness from the British ordnance authorities.

The building for the manufacture of gun-cotton is of wood, one story high, 160 feet in length, heated throughout with the exhaust steam from the engine, and is wholly devoted to the manufacture of gun-cotton; excepting one room where nitro-glycerine has been made; the plant being small, this has not been disturbed.

The cooling pits, embracing a large portion of Room I, will be supplied from the sea by a powerful 12 by 12 inch Knowles fire and circulating pump, capable of throwing 300 gallons a minute. Four hydrants connected with this pump are located at equal distances through the building, which will enable two large streams to be utilized at a moment's notice, and ought, with the fire-apparatus of the station, to reduce to the minimum any danger from fire or explosion. As a large amount of fresh water will be required, an artesian well 170 feet deep is in the process of being sunk. The machinery will be run by a new Armington & Sims engine of 25 H. P.

The plant has been calculated to supply a daily output of 300 pounds of dry cotton, but as this would greatly exceed the present demands of the service I think it will be preferable to turn out a less product by employing a smaller force and running regularly through the year. Since the strongest nitric acid alone can be employed in the conversion of the cotton, and as it is dangerous to be handled in ordinary carboys, strong stone jugs, holding 5 gallons each, have been imported from England. About fifty of these will make a car-load, and it is designed to have such a number always at the manufacturers ready for transportation, it not being desirable or convenient to store a large quantity of such strong acid at the station. A cellar has been excavated under Room I, from which the acid will be lifted to the mixing floor.

The accompanying plan will fully give the location and character of the different machines used in the manufacture.

Divisions in gun-cotton laboratory.

- | | |
|---|--|
| I.—Acid mixing, acid receivers, gun-cotton dipping, cooling pits. | IX.—Laboratory. |
| II.—Nitro-glycerine, salt-water pump, salt-water tank. | X.—General work-room. |
| III.—Dynamite—fresh-water tank. | XI.—Boiler-room. |
| IV.—Pulping, poachers, lime tank. | XII.—Engine-room. |
| V.—Gun-cotton immersion, acid wringer. | XIII.—Storing dry cotton. |
| VI.—Water wringer. | XIV.—Drying cotton. |
| VII.—Steam boiling. | XV.—Preliminary drying of cotton after alkali boiling. |
| VIII.—Stuff chest, molding presses, and pump packing gun-cotton. | XVI.—Cotton picking. |
| | XVII.—Final pressing of gun-cotton. |

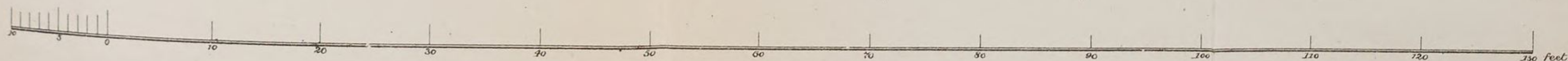
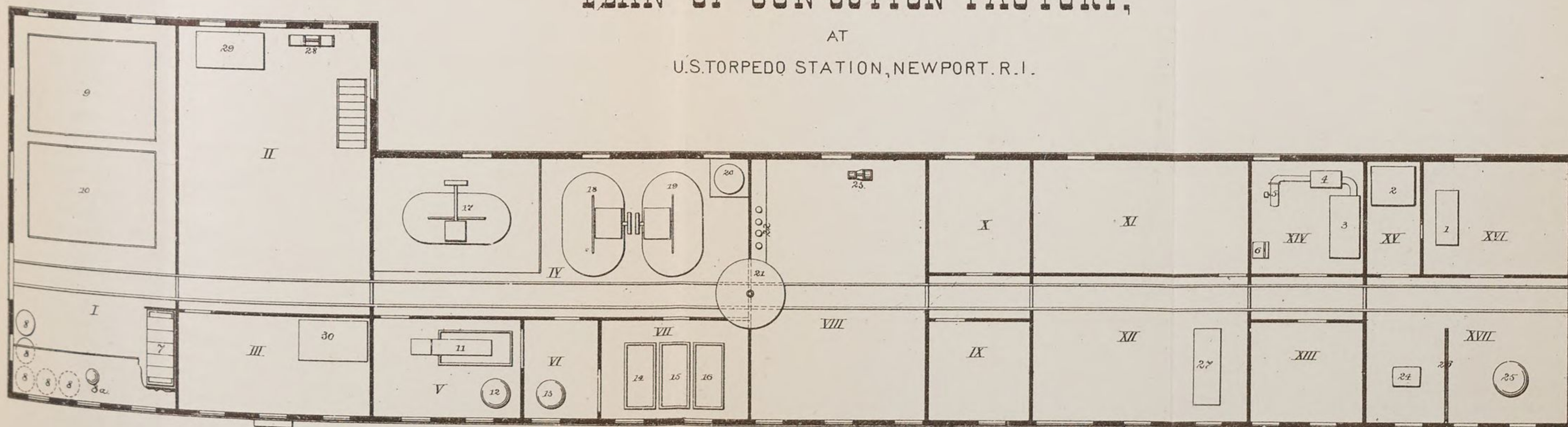
Gun-cotton apparatus.

- | | |
|---|--|
| 1. Cotton picker. | 17. Gun-cotton pulper. |
| 2. Preliminary dryer for cotton (after alkali boiling). | 18 and 19. Poachers. |
| 3. Final dryer of cotton. | 20. Lime tank. |
| 4. Steam air-heater for final dryer. | 21. Stuff chest. |
| 5. Air-blower. | 22. Molding presses. |
| 6. Engine for air-blower. | 23. Pressure pump for molding presses. |
| 7. Dipping tank. | 24. Pressure pump for final hydraulic press. |
| 8. Acid receiver. | 25. Final hydraulic press. |
| 8. a Acid mixer. | 26. Rope screen between hydraulic press and man attending. |
| 9 and 10. Cooling pits. | 27. Main engine. |
| 11. Immersion machine. | 28. Fire and circulating pump. |
| 12. Acid wringer. | 29. Salt-water tank. |
| 13. Water wringer. | 30. Fresh-water tank. |
| 14, 15 and 16. Steam-boiling tanks. | |

PLAN OF GUN-COTTON FACTORY,

AT

U.S. TORPEDO STATION, NEWPORT, R.I.



HART & VON ARX, 21 PARK PLACE, N.Y.



Approved
Montgomery Sicard
 Chief of Bureau.

CONTACT TORPEDO.

Experiments have shown that the explosion of 30 pounds of gun cotton cannot be expected to produce destruction of the object beyond a horizontal distance of six feet. In the excitement of a night attack it would be extremely difficult to judge of this distance, and the chances would be that with all the risk, the explosion would not produce a successful result. It has seemed to me very desirable that we should have a torpedo that would explode only on contact with the object of attack. I have therefore submitted to the Bureau the plans for such a torpedo, and four are now ready to be sent to the Trenton.

It is not desirable in this report to explain the construction of the mechanism, but it suffices to remark that as the device is confined entirely to the "primer case," no change is required in the service case, or the mode of loading it. Experiments have been made here as to the value of this mechanism in the construction of electro-contact mines from material on board of ship. The arms were lengthened, the case placed in an empty powder barrel, and anchored 2 feet under water. The Billow was then run over the mine at different times, and in every case the mine would have exploded on being struck. I would recommend further experiments in this direction, and, if successful, that four contact primer cases be furnished ships of war, to be placed if needed in water casks, or some other water-tight receptacle, and employed as observation mines.

Steel instead of wooden spars have been experimented with very successfully during the past season. As many as a dozen torpedoes have been fired from one of these spars, and it is apparently as perfect as ever. They weigh each some fifty pounds more than those of wood. With these steel spars has been fitted a light serviceable boat equipment of iron, by which one man can easily rig out the spar, and indeed, if the boat is not going over three knots, the spar will rig out of itself.

In conclusion, it gives me pleasure to bear witness to the ability and zeal of the able corps of assistants under my command, to whom I am indebted for many valuable suggestions, and upon whom devolved the chief labor of the annual class instruction.

Respectfully submitted.

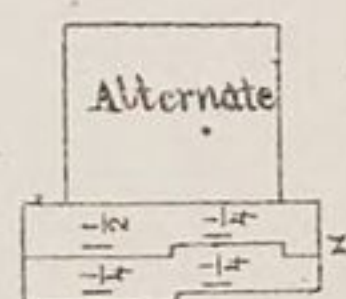
THOS. O. SELFRIDGE,
Captain and Inspector of Ordnance,
In charge of station.

5^{IN} W-W.-B-L-R

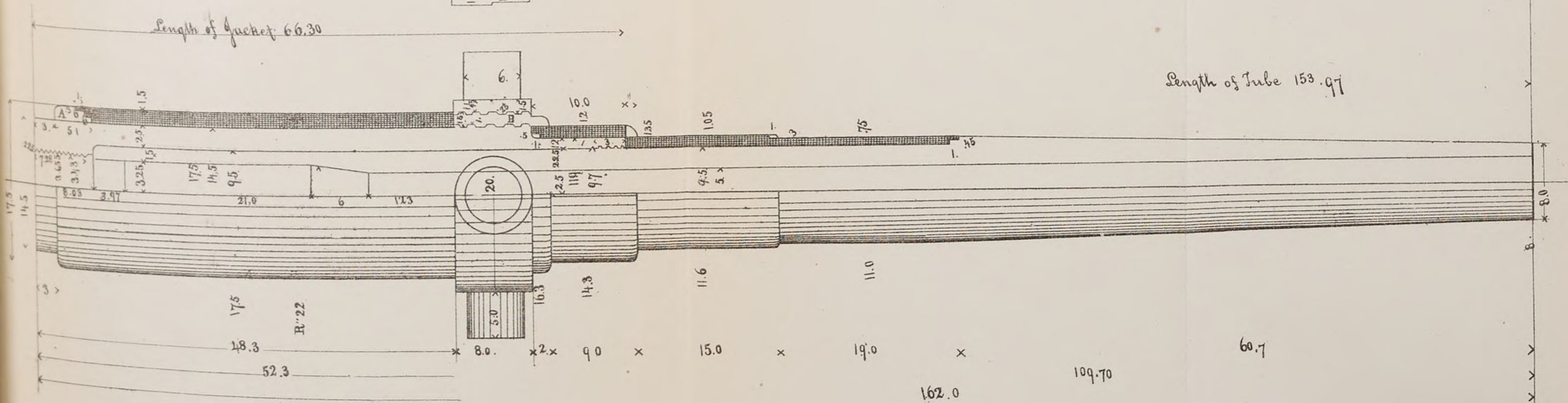
WEIGHT 5700

center of gravity at center of transverse

Scale $\frac{1}{10}$ th



The locking Ring z may, or may not be used.



HART & VON ARX, 21 PARK PLACE, N.Y.

Bureau of Ordnance
July 10th 1883



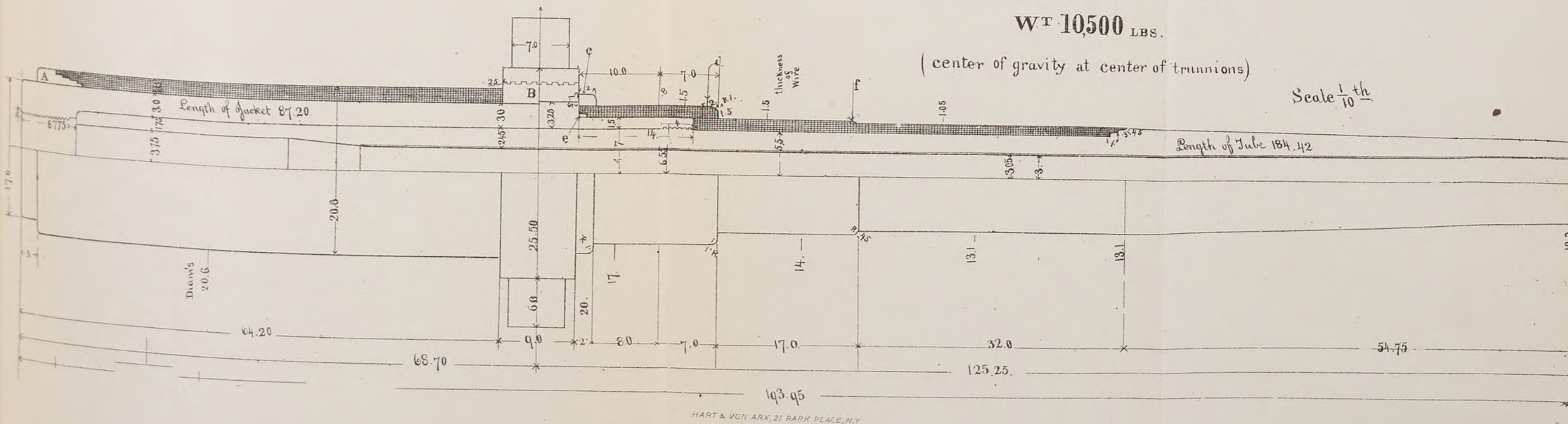
Approved
M. J. Leonard
Chief of Bureau

6 IN W, W, B-L-R.

WT 10,500 LBS.

(center of gravity at center of trunnions)

Scale $\frac{1}{10}$ th



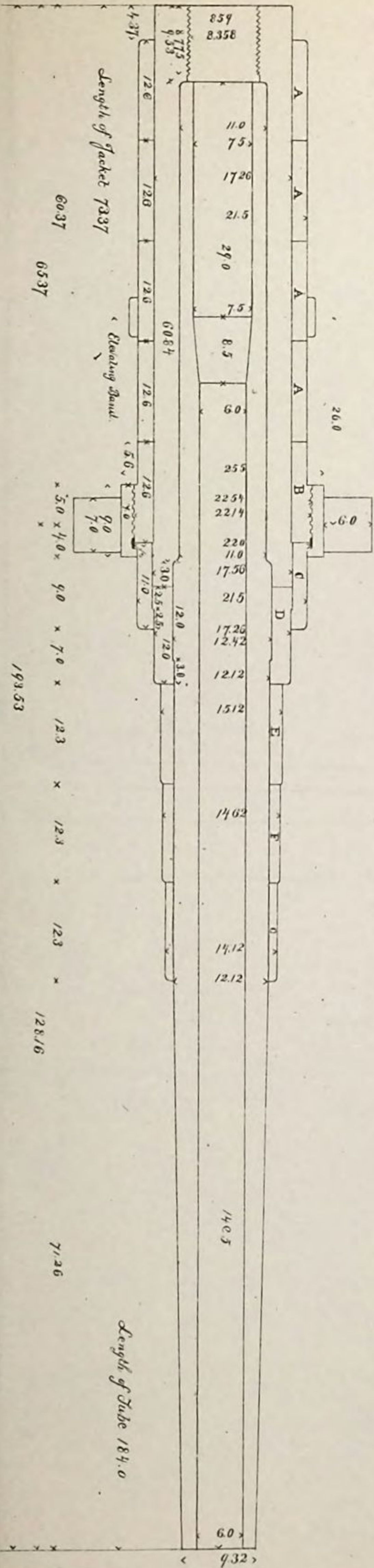
HART & VON ARX, 21 PARK PLACE, N.Y.



Approved
Marguerite Picard
Chief of Bureau.

6 IN HOOPED B-L-R.

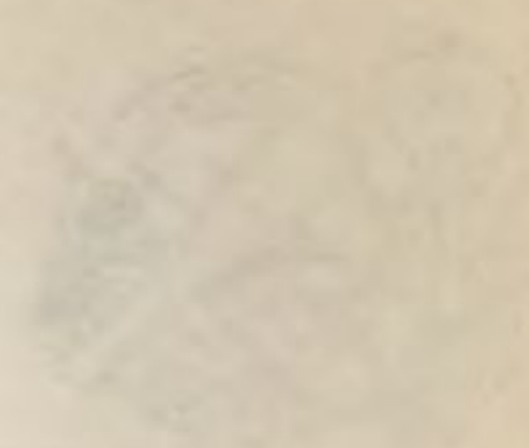
SCALE 1/10



HART & VON ARX, 21 PARK PLACE, N.Y.

Bureau of Ordnance
Navy Dept.
November 15th 1883

Approved
M. G. Leland
Chief of Bureau

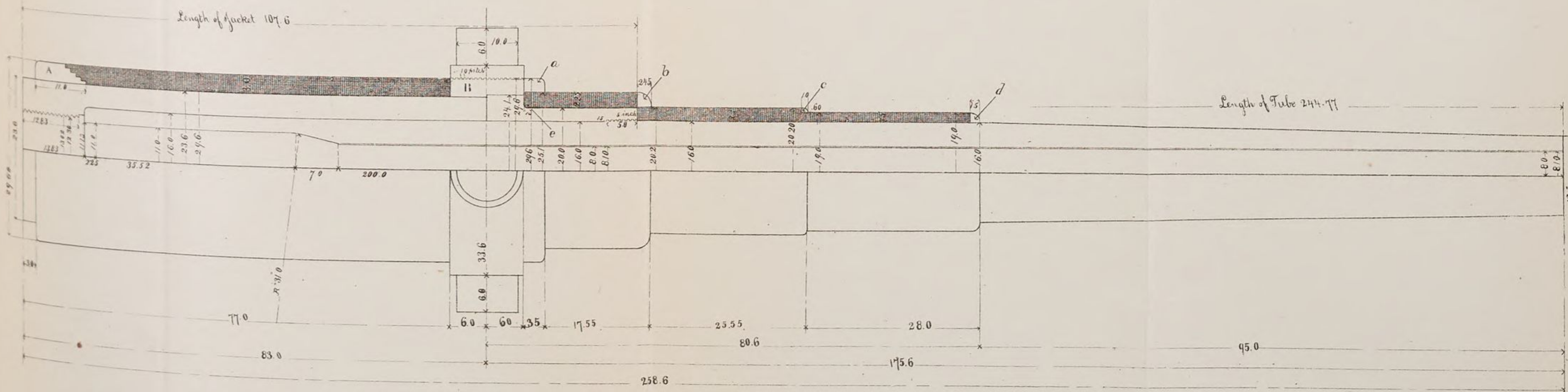


С. И. М. И. В. И. И.

8 IN. W-W-B-L-R

WEIGHT 27,000 LBS.

Scale $\frac{1}{10}$ "



HART & VON ARX, 21 PARK PLACE, N.Y.



Approved
Mulgrave, L. C.
Chief of Bureau

SEMPER PARATI

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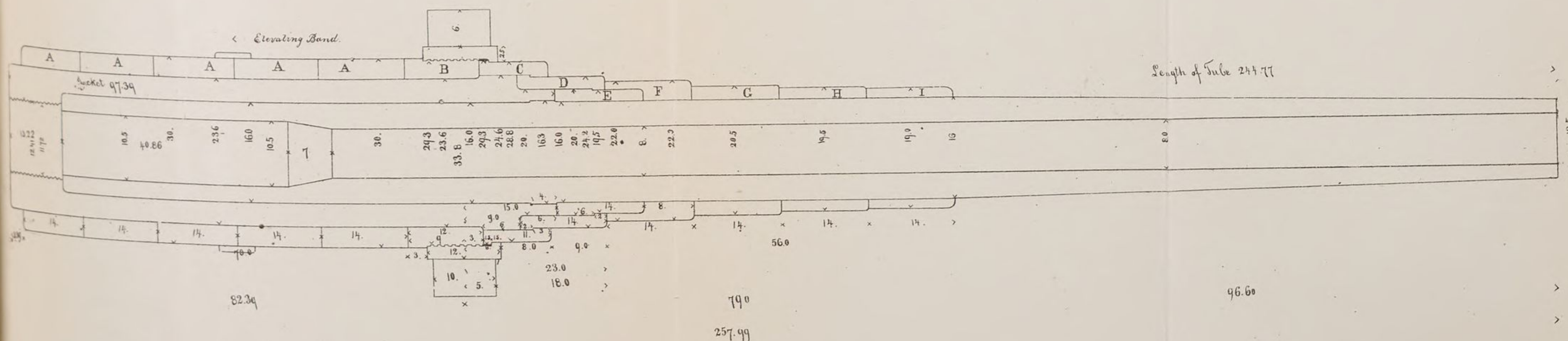
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1870

8 IN HOOPED BLR.

SCALE $\frac{1}{10}$



HART & VON ARX, 21 PARK PLACE, N.Y.

Bureau of Ordnance Navy Dept.
Nov 14th 1883.



Approved
M. L. Seward
Chief of Bureau

8th March 1811

My dear Sir

100

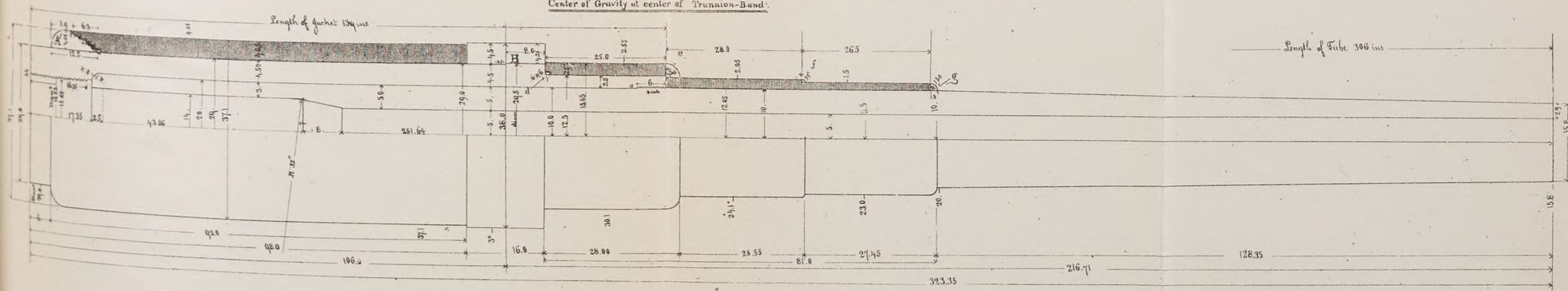
100

10^{IN} WIRE-WOUND GUN .

(WEIGHT 48,500 LBS.)

SCALE $\frac{1}{10}$ IN

Center of Gravity at center of Trunnion-Band.



HART & VON ARX, 21 PARK PLACE, N.Y.



Approved
Montgomery L. L. L.
 Chief of Bureau

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8	Anna King	505 Ash St	Queens	NY	11352
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REPORT
OF THE
SECRETARY OF THE NAVY;

BEING PART OF
THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE
TWO HOUSES OF CONGRESS
AT THE
BEGINNING OF THE FIRST SESSION OF THE FORTY-EIGHTH CONGRESS.

IN TWO VOLUMES.

VOLUME II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

THE SECRETARY OF THE ARMY
WASHINGTON

REPORT

SECRETARY OF THE ARMY

THE MESSAGE AND REPORT

TO THE HOUSE OF REPRESENTATIVES

IN THE YEAR 1871

BY THE SECRETARY

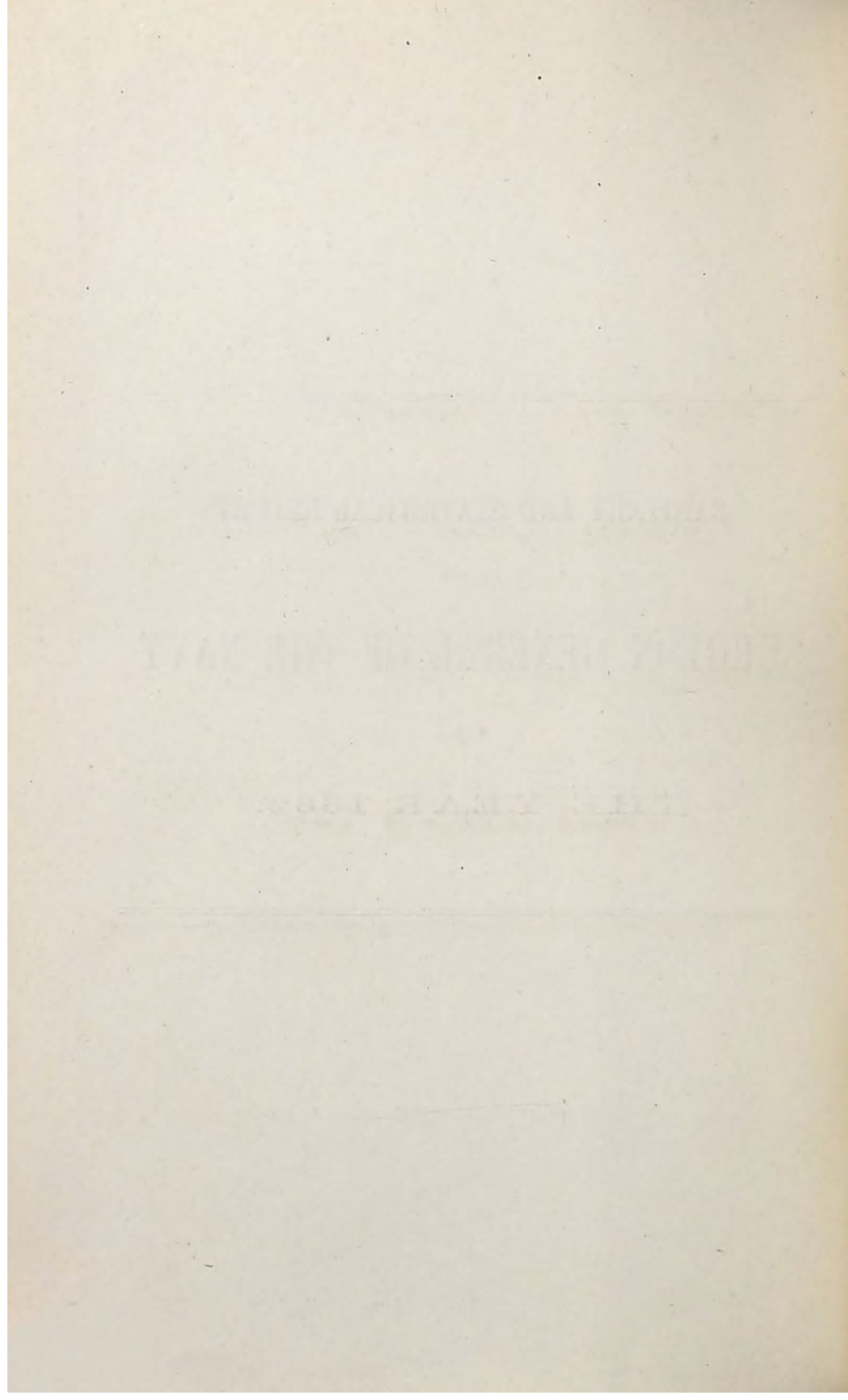
JOSEPH W. FORT

WASHINGTON

GOVERNMENT PRINTING OFFICE

1871

SANITARY AND STATISTICAL REPORT
OF THE
SURGEON GENERAL OF THE NAVY
FOR
THE YEAR 1882.



LETTER OF TRANSMITTAL.

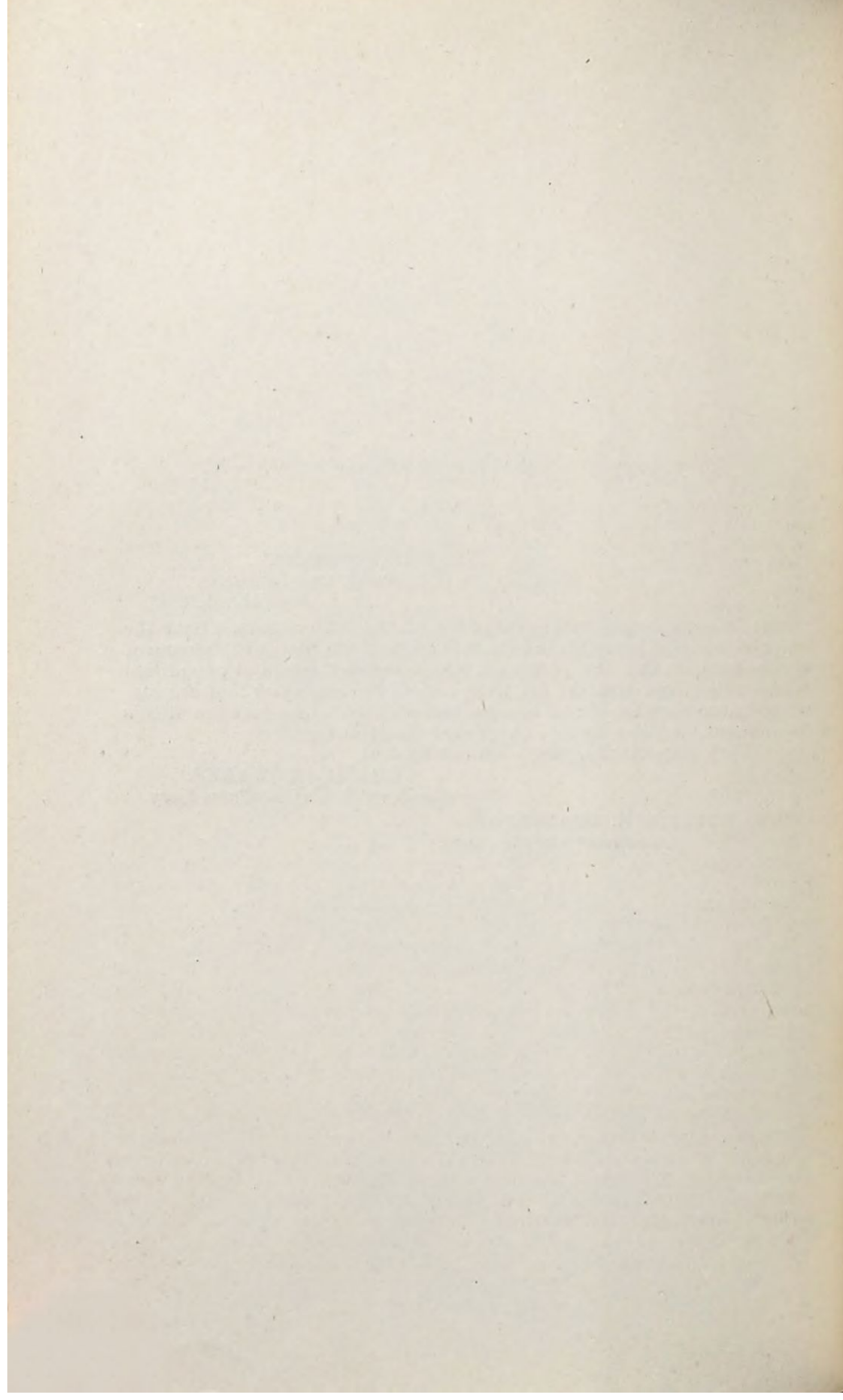
NAVY DEPARTMENT,
BUREAU OF MEDICINE AND SURGERY,
November 1, 1883.

SIR: In compliance with your order of the 13th ultimo, I have the honor to transmit herewith the annual report of the Medical Department of the Navy during the year 1882, which shows the sanitary condition of the ships and stations for that period, the estimates that are considered necessary for the economical and efficient administration of this department, and the state of the Naval Hospital Fund.

Very respectfully, your obedient servant,

PHILIP S. WALES,
Surgeon General, United States Navy.

Hon. WILLIAM E. CHANDLER,
Secretary of the Navy.



REPORT

OF

THE SURGEON GENERAL OF THE NAVY

FOR THE YEAR 1882.

The first report of the Bureau of Medicine and Surgery in which any attempt was made to present an accurate, full, and trustworthy statistical exhibit of the sanitary condition of the Navy, was issued in 1880, and the plan then adopted has been improved each succeeding year, so that a uniform system of tabulation of disease has been developed, which, it is believed, will in the course of a few years furnish a mass of important facts bearing upon the geographical distribution of disease, its character, frequency, course, and duration, as it occurs among men of the Navy at different ages, and upon such modifications as it suffers from the peculiarities by which these men are surrounded, as regards food, clothing, climate, and the altogether exceptional nature of the floating habitations in which they live.

Prior to the issuance of the above-mentioned report, outside of individual impressions and experiences published from time to time in a fragmentary form, there existed an absolute ignorance of all matters pertaining to these topics, so essential to a correct appreciation of and progress in nautical sanitation. Other navies of the world had already for years, in some form or other, issued reports intended to furnish the desired information, and notably the English navy, of which the reports were begun in 1837 and have been continued to the present time. Their value is very great, as they cover so many years that immense aggregates of the tabulated diseases as they occur under the usual conditions of marine life are furnished; and thus the accuracy of the general deductions from them bearing upon nautical sanitation and the geographical distribution of diseases is greatly insured. The four tabulated reports now issued by this office cover 54,646 cases, which even now enable us to determine certain general facts concerning the number, duration, variety, and distribution of disease among the naval forces stationed at various points, at home and abroad; but the time has not yet arrived when the Bureau might reasonably be called upon to issue a condensation of the facts accumulated, and to present the general deductions that grow out of them for the benefit of the Navy and in the interest of sanitary science. Still greater advantages would accrue by increasing the range and magnitude of these tabular exhibits by the co-operation of the great naval powers, and to this end the Bureau would call the attention of the Department to the desirability of inviting the chiefs of the medical departments of those powers to a conference, with a view to the adoption of a uniform nomenclature, classification, and tabulation of disease. Such conjoint efforts would open up new avenues

for the investigation of the laws which govern the origin and dispersion of epidemic influences.

A comparison of the naval medical reports of different nations, already published, covering all quarters of the globe, point to the fact that there is a general periodicity in morbidity. There are years when over the entire globe there seems to be an almost universal decrease of activity of morbid causes, while there are others in which the reverse occurs, the morbidity running in higher ranges. Are these variations due to some mysterious general cosmical conditions developed contemporaneously at various quarters of the globe, or to great waves of morbidity arising in certain localities, and successively invading others at remoter points? Records kept in the uniform manner indicated, over the vast extent of the earth's surface comprehended in the range of observation of naval medical officers, will contribute largely to throw light upon this and other questions involving the origin and dispersion of disease. In fact, pathological maps displaying its movements might be constructed on the same plan as those issued by the Signal Bureau showing the varying meteorological phenomena.

APPROPRIATIONS.

Although much has been done in the last four years to elevate the professional standard of the Medical Department of the Navy, and to enhance its efficiency by furnishing officers opportunities for scientific study, and to equip the hospitals and stations with the most improved surgical apparatus and appliances, and medical supplies of the best quality and in sufficient quantity and variety, yet the task has been accomplished only by unwearied attention to minute administrative details in expenditures; and though the department has been tided over the embarrassments arising from insufficient appropriations, yet the effects of this policy have been felt, and sooner or later continuous neglect will entail larger expenditures to restore the hospital establishments to what they are at present, than would have been necessary had the annual appropriations been liberal. Success, however, in any methodical administration, possessing vigor and efficiency, depends largely upon ample and continuous appropriations, which, happily in this case, can easily be determined by well-known standards of expenditures established by experience as necessary for the maintenance of the sick.

The appropriations for the Medical Department of the Navy have been fixed arbitrarily, without regard to the actual needs of the service or conformity to any standard of requirement, as is shown in the varying amounts annually set apart for the support of the sick and wounded. Since the close of the war, the aggregate has steadily decreased, so that at the present time it is not adequate to maintain the hospital establishments in good condition, or provide the sick with the customary number of attendants. For these reasons the Bureau would earnestly call your attention to the necessity of at least increasing the appropriations for repairs and maintenance of hospitals and the employment of attendants to what they were the last fiscal year but one.

*Estimates of appropriations required for the service of the fiscal year ending June 30, 1885
by the Bureau of Medicine and Surgery.*

Detailed objects of expenditure, and explanation.	Estimated amount which will be re- quired for each de- tailed object of ex- penditure.	Amount appropri- ated for the cur- rent fiscal year ending June 30, 1884.
SALARIES.		
One chief clerk (R. S., p., 70, sec. 416).....	\$1,800 00	
One clerk, class three (act of March 3, 1883).....	1,600 00	
One clerk, class two (act of March 3, 1883).....	1,400 00	
One clerk, class one (act of March 3, 1883).....	1,200 00	
One clerk, (act of March 3, 1883).....	1,000 00	
One assistant messenger (act of March 3, 1883).....	720 00	
One laborer (act of March 3, 1883).....	660 00	
One assistant chemist for Naval Dispensary (act of March 3, 1883).....	480 00	
One janitor for Naval Dispensary (act of March 3, 1883).....	600 00	
	9,460 00	\$9,460 00
CONTINGENT EXPENSES.		
Stationery and miscellaneous items.....	400 00	400 00
MEDICAL DEPARTMENT.		
For support of the Medical Department, for surgeons' necessities, for vessels in commission, navy-yards, naval stations, Marine Corps, and Coast Survey (appropriated, 22 Stat. at L., p. 476, sec. 1).....	40,000 00	40,000 00
NAVAL HOSPITAL FUND.		
For the maintenance of the naval hospitals at Portsmouth, N. H., Chelsea, Mass., Brooklyn, N. Y., Philadelphia, Pa., Annapolis, Md., Washing- ton, D. C., Norfolk, Va., Pensacola, Fla., Mare Island, Cal., and Yoko- hama, Japan (appropriated, 22 Stat. at L., p. 476, sec. 1).....	30,000 00	30,000 00
CONTINGENT.		
For contingent expenses of the Bureau, freight on medical stores, trans- portation of insane patients, advertising, telegraphing, purchase of books, expenses attending the board of medical examiners, rent of rooms for Naval Dispensary and Museum of Hygiene; hygienic and sanitary investigation and illustration; purchase and repair of wagons, harness; purchase and feed of horses and cows, trees, garden tools, seeds, &c. (appropriated, 22 Stat. at L., p. 476, sec. 1).....	25,000 00	25,000 00
REPAIRS.		
For repairs to Naval Laboratory, naval hospitals, and appendages, includ- ing roads, wharves, out-houses, sidewalks, fences, gardens, farms, cem- eteries, &c. (appropriated, 22 Stat. at L., p. 476, sec. 1).....	30,000 00	15,000 00
CIVIL ESTABLISHMENT.		
For pay of employes at the several naval hospitals, navy-yards, Naval Laboratory, and Naval Academy (appropriated, 22 Stat. at L., p. 476, sec. 1).....	40,000 00	20,000 00

The following exhibit shows the condition of the Naval Hospital Fund:

NAVAL HOSPITAL FUND.

Balance on hand October 1, 1882.....	\$162,268 72
Transferred to the credit of the fund in settlement of accounts by the Fourth Auditor, from October 1, 1882.....	44,163 03
Cr. By appropriation for the fiscal year ending June 30, 1884.....	30,000 00
Total.....	236,431 75
Deduct amount expended from October 1, 1882, to October 1, 1883.....	104,561 49
Balance on hand October 1, 1883.....	131,870 26

HOSPITALS.

The hospital organization now in vogue in the United States Navy is the outcome of the law of 1811, which provided for the purchase of suitable sites, and the erection of such naval hospitals as might be necessary at various points. From time to time such buildings were erected, those at Chelsea, Mass., Brooklyn, N. Y., and Norfolk, Va., in 1831; Pensacola, in 1836; at Washington, D. C., in 1864; at Philadelphia, Pa., in 1866; at Mare Island, Cal., and Annapolis, Md., in 1869.

The hospital at Pensacola, Fla., was destroyed during the rebellion, and its place has been filled by a wooden structure. Some of the hospitals are of an antiquated style, and no longer fill the conditions required by the advances made in sanitary science, and all of them are much too large and expensive for either present necessities or prospective requirements.

A few are ineligibly situated for the purposes for which they are designed, and in the case of those at Chelsea and Brooklyn are located upon sites with inclosures in great excess of real needs, and which, from their central locations in those cities, have greatly appreciated in value. In view of these facts, the Bureau would recommend, in order to secure greater economy of administration, to adapt the hospitals to the wants of the service, and to secure better sanitary conditions, that the whole system of hospital administration be changed; that the hospitals at Chelsea, Mass., Brooklyn, N. Y., and Philadelphia, Pa., be sold, and the proceeds turned into the Naval Hospital Fund, from which the money was drawn to make the original purchase, and that it be invested in Government securities, the interest on which would go far to make the system self-supporting and independent of annual appropriations and changes in the political aspect of administration.

Instead of the hospitals so disposed of, station hospitals of such size as to meet the requirements of the service be erected at desirable points. These hospitals would not cost over \$15,000 to build and equip; they would serve to accommodate all acute cases and those likely to be of brief duration, while the chronic cases and those likely to run a protracted course should be sent to a general hospital, located at a central point; and, in the opinion of the Bureau, none could be found better fitted for this purpose than Norfolk, Va., on account of the mildness and salubrity of the climate, easy accessibility of this port at all seasons of the year, and the adaptability of the grounds and buildings already possessed by the Government.

At this same point the laboratory now in Brooklyn, N. Y., should be established for the distribution of supplies to the ships and stations; and the already overflowing wards of the Government Asylum for the Insane could be relieved of the naval cases. It is calculated that the general hospital would have an average population of 500 or 600, a number that would furnish ample means for the clinical instruction of medical officers of the Navy. Instead of expending large sums of money in keeping seven large hospitals, partially occupied, in repair, there would be but one to maintain, and that fully occupied by patients. It would, of course, be necessary to maintain the hospital at Mare Island, California, as it is the only station on the Pacific coast accessible to the naval forces.

The comparative salubrity of the different naval hospitals, as shown by an analysis of 5,364 cases treated, during a period of four years, from 1879 to 1883.

[Ratio per thousand.]

Classes of diseases.	Chelsea, Mass.				Brooklyn, N. Y.			
	Cases.	Recovered.	Invalided.	Died.	Cases.	Recovered.	Invalided.	Died.
Zymotic	72.63	60.52	1.34	8.04	69.36	57.12	8.84	2.72
Constitutional	234.03	177.54	3.21	5.36	278.80	201.96	67.32	4.08
Nervous system	60.52	32.28	26.90	.....	63.24	25.16	36.04	.68
Eye	33.62	26.90	5.38	.....	22.42	14.28	8.16	.....
Ear	10.76	5.38	5.38	.....	8.16	4.03	3.40	.....
Teeth .....	.....	.....	.....	.....	.68	.....	.68	.....
Circulatory system	21.52	13.45	4.03	1.34	42.16	15.64	23.12	2.04
Respiratory system	156.02	86.03	30.93	9.41	142.80	81.60	48.28	12.92
Digestive system	76.62	52.45	16.14	.....	89.76	51.68	31.96	4.08
Genito-urinary system	137.19	110.29	14.79	.....	97.20	73.44	19.72	2.72
Locomotive system	12.10	9.41	1.34	.....	14.96	7.48	6.12	.....
Integumentary system	86.08	78.01	4.03	.....	46.92	32.64	12.24	.68
Absorbent system	10.76	9.41	1.34	.....	23.12	20.40	2.72	.....
Tumors and cysts	5.38	4.03	.....	.....	5.44	4.08	1.36	.....
Poisons	8.07	8.07	.....	.....	9.52	7.48	2.04	.....
Violent diseases and deaths	73.97	49.76	13.49	.....	85.68	53.04	18.56	1.36

Classes of diseases.	Philadelphia, Pa.				Washington, D. C.			
	Cases.	Recovered.	Invalided.	Died.	Cases.	Recovered.	Invalided.	Died.
Zymotic	114.66	107.64	3.51	2.34	210.39	195.60	8.15	6.52
Constitutional	181.35	143.91	15.21	16.38	159.84	135.38	16.31	4.89
Nervous system	90.09	51.48	15.21	17.55	50.56	35.88	9.78	3.26
Eye	11.70	7.02	3.51	.....	16.56	14.67	3.26	.....
Ear	2.34	2.34	.....	.....	3.26	1.63	1.63	.....
Teeth .....	.....	.....	.....	.....	.....	.....	.....	.....
Circulatory system	10.53	7.02	2.34	1.17	40.77	16.56	11.41	3.26
Respiratory system	80.73	53.82	3.51	16.38	135.38	104.38	13.04	13.04
Digestive system	109.98	84.24	8.19	11.70	107.64	99.49	6.52	1.63
Genito-urinary system	51.48	31.59	15.21	1.17	91.33	81.55	4.89	.....
Locomotive system	8.19	5.85	2.34	.....	4.89	.....	3.26	.....
Integumentary system	42.12	37.44	4.68	.....	26.09	22.83	3.26	.....
Absorbent system	9.36	9.36	.....	.....	39.14	37.51	.....	.....
Tumors and cysts	1.17	1.17	.....	.....	1.63	1.63	.....	.....
Poisons	196.56	194.22	1.17	1.17	17.94	16.31	1.63	.....
Violent diseases and deaths	91.26	79.56	3.51	3.51	91.33	81.55	8.15	.....

Comparative salubrity of the different naval hospitals, &c.—Continued.

Classes of diseases.	Norfolk, Va.				Pensacola, Fla.			
	Cases.	Recovered.	Invalided.	Died.	Cases.	Recovered.	Invalided.	Died.
Zymotic	136.68	119.59	9.04	6.03	139.53	116.27	23.25	.....
Constitutional	216.07	145.72	54.27	4.02	209.29	116.27	69.96	.....
Nervous system	45.22	22.11	19.09	3.01	23.25	.....	23.25	.....
Eye	15.07	11.05	3.01	.....	.....	.....	.....	.....
Ear	10.05	5.02	5.02	.....	.....	.....	.....	.....
Teeth .....	.....	.....	.....	.....	.....	.....	.....	.....
Circulatory system	45.22	28.14	16.08	1.00	23.25	23.25	.....	.....
Respiratory system	162.81	92.46	51.25	11.05	162.78	139.53	23.25	.....
Digestive system	87.43	56.28	22.11	3.01	116.27	69.96	46.51	.....
Genito-urinary system	110.55	77.38	24.12	2.01	93.02	69.96	23.25	.....
Locomotive system	11.05	7.03	2.01	.....	.....	.....	.....	.....
Integumentary system	40.20	22.11	13.06	.....	46.51	46.51	.....	.....
Absorbent system	23.11	18.09	2.01	1.00	.....	.....	.....	.....
Tumors and cysts	1.00	1.00	.....	.....	.....	.....	.....	.....
Poisons	2.01	1.00	1.00	.....	23.25	23.25	.....	.....
Violent diseases and deaths	93.46	56.28	33.16	1.00	162.78	162.78	.....	.....

Classes of diseases.	Mare Island, Cal.				Total.			
	Cases.	Recovered.	Invalided.	Died.	Cases.	Recovered.	Invalided.	Died.
Zymotic	58.97	52.76	1.55	1.55	99.92	93.40	6.15	4.28
Constitutional	248.32	155.20	83.80	4.65	227.62	164.61	47.91	6.33
Nervous system	114.84	52.76	51.21	3.10	68.23	34.11	27.03	4.28
Eye	32.59	12.41	17.07	.....	21.62	13.79	6.52	.....
Ear	12.41	10.86	1.55	.....	7.82	4.96	2.98	.....
Teeth	4.65	3.10	1.55	.....	.74	.37	.37	.....
Circulatory system	40.35	13.96	21.72	3.10	34.30	16.40	14.53	1.86
Respiratory system	186.24	99.32	62.08	9.31	142.99	85.01	36.72	12.11
Digestive system	83.80	57.42	21.72	1.55	92.28	64.13	20.13	3.91
Genito-urinary system	54.32	32.59	20.17	.....	92.28	68.60	17.52	1.30
Locomotive system	7.76	4.65	3.10	.....	10.62	6.15	3.35	.....
Integumentary system	38.80	31.04	1.55	.....	46.97	35.04	8.38	.18
Absorbent system	23.28	20.17	1.55	.....	20.87	18.45	1.67	.18
Tumors and cysts	6.20	4.65	.....	1.55	3.54	2.79	.55	.18
Poisons	7.76	7.76	.....	.....	38.59	37.09	1.30	.18
Violent diseases and deaths	79.15	51.12	23.28	3.10	86.50	60.94	20.13	1.49

MUSEUM OF HYGIENE.

The Bureau takes particular pleasure in calling attention to the gratifying progress made in building up the Museum of Hygiene, which is being so rapidly added to that its present quarters are already overflowing with valuable donations from all quarters of the United States from those who are interested in sanitary science, and it now rivals its sister institution in Europe. This rapid expansion of so important an enterprise was fully anticipated, but the limited means at the disposal of the Bureau prevented any action towards securing more ample accommodations, and now it earnestly recommends that the United States Naval Hospital at Washington be devoted to this purpose. With very little alteration it can be admirably adapted to serve this object.

LIBRARIES.

It was long a constant source of complaint that medical officers of the Navy had not access to current medical literature, for the reason

that the Bureau did not supply books and periodicals to the stations and to ships in commission. This want was especially felt by assistant surgeons on foreign service, who were expected to be familiar with the advances in medical science at the examinations for promotion held on their return home. The Bureau felt that these complaints were well founded, and in order to remove them organized, at each hospital and station, a working medical library containing most of the important and recent works, accessible to all officers. Periodicals of a general character, as well as those devoted to special branches of medical science, were furnished to flagships, with instructions that they should be circulated among other vessels of the squadron. In this way it was possible, at small cost, to place within reach of all officers, at the most remote stations, the freshest professional information; and, as far as the Bureau has been able to ascertain, the plan of a "circulating library" has been a success.

To those officers who are engaged in original research, or preparing papers on special subjects, the library of the Museum of Hygiene is always accessible, which is especially rich in works on sanitation and nautical medicine. There are now on the shelves six thousand volumes, a catalogue of which is being prepared that will greatly facilitate the work of reference.

MEDICAL SUPPLIES.

The medical supplies of the Navy have, for many years, been drawn from the naval laboratory at Brooklyn, N. Y., and the various articles on the supply table were partly manufactured at this establishment, and partly obtained by open purchase. The Bureau, however, becoming convinced that this institution, with its limited means and capacity, could by no means compete with the extensive establishments of the country, using immense capital and the most improved apparatus in their work, it was determined to discontinue the manufacture of medical preparations.

Under competitive bids from several houses of the highest reputation, the supplies have been purchased for the past four years, and at such a saving that the annual appropriation for this purpose, which had formerly but scantily sufficed for the needs of the service, has now proved adequate for the supply of everything necessary for the care of the sick, and enables the Bureau to provide instruments and apparatus of the most recent and approved character to the various stations.

RECRUITING.

During the year 1882, there were examined, in all, 8,703 recruits, of whom 3,150 were rejected for various physical defects, which gives a percentage of 36. This is an increase of 8 per cent. over the rejections 1880, and 5 per cent. over those of 1881.

This increase might arise either from greater care taken by the officers engaged in recruiting service, or from the class furnishing the recruits becoming physically more deteriorated than in past years, or from their being drafted from a lower class than in previous years. Of the total number examined, 6,452 were men, of whom 1,578 were rejected, 24 per cent.; and 2,251 were boys, of whom 1,572 were rejected, 70 per cent. In 1880, the percentage for men was 20, and for boys 39; in 1881, for men 28, and for boys 38.

Table showing the number and causes of rejection of all persons examined for the United States naval service during the year 1882.

Causes of rejection.	Over twenty- one years of age.	Twenty- one years of age and under.	Total.
	Men.	Boys.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Erysipelas.....	1	.....	1
Febricula.....	1	.....	1
Febris intermittens.....	5	1	6
Febris typhus.....	1	.....	1
Total.....	8	1	9
II.—CONSTITUTIONAL DISEASES.			
Adynamia.....	2	1	3
Anæmia.....	1	5	6
Condylomata penis.....	1	.....	1
Rheumatismus chronicus.....	1	2	3
Scrofula.....	4	7	11
Syphilis primitiva.....	48	10	58
Syphilis consecutiva.....	120	11	131
Tuberculosis.....	.....	1	1
Total.....	177	37	214
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Dementia.....	1	3	4
Epilepsia.....	2	5	7
Insipientia ingenta.....	63	71	134
Melancholia.....	2	.....	2
Total.....	68	79	147
II.—DISEASES OF THE EYE.			
Achromatopsia.....	53	64	117
Amaurosis.....	4	3	7
Asthenopia.....	2	.....	2
Cataracta.....	1	.....	1
Conjunctivitis.....	4	.....	4
Corneæ opacitas.....	1	.....	1
Ectropium.....	.....	3	3
Myopia.....	108	90	198
Ophthalmia tarsi.....	1	.....	1
Pterygium.....	6	1	7
Strabismus.....	4	1	5
Visus deterior.....	220	191	311
Total.....	406	353	759
III.—DISEASES OF THE EAR.			
Otitis.....	1	.....	1
Otorrhœa.....	4	9	13
Surditas.....	3	5	8
Total.....	8	14	22
IV.—DISEASES OF THE NOSE.			
Ozæna.....	5	3	8
Total.....	5	3	8
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Cor irritabile.....	32	26	58
Dilatatio cordis.....	3	1	4
Hypertrophia cordis.....	25	33	58
Morbi valvularum cordis.....	126	44	170
Palpitatio.....	37	23	60
Varix.....	58	26	84
Total.....	281	153	434

Table showing the number and causes of rejection of all persons examined, &c.—Continued.

Causes of rejection.	Over twenty- one years of age.	Twenty- one years of age and under.	Total.
	Men.	Boys.	
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Asthma	1	.....	1
Bronchitis acuta	8	10	18
Catarrhus bronchialis	3	1	4
Catarrhus nasalis	9	18	27
Laryngitis .....	.....	1	1
Phthisis pneumonica acuta	5	.....	5
Phthisis pneumonica chronica	1	.....	1
Pleuritis	1	.....	1
Total	28	30	58
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Ascites	1	2	3
Caries dentium	52	53	105
Fistula in ano	5	.....	5
Hæmorrhoids	39	6	45
Hernia	59	33	92
Pharyngitis	7	7	14
Prolapsus ani	3	.....	3
Tonsillitis chronica	13	62	75
Total	179	163	342
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria .....	.....	1	1
Balanitis	4	5	9
Enuresis	1	9	10
Gonorrhœa	63	16	79
Hydrocele	5	4	9
Hypospadia	1	1	2
Orchitis	5	1	6
Phymosis	14	19	33
Urethræ strictura	4	.....	4
Varicocele	62	88	150
Testiculus retentus	3	10	13
Total	162	154	316
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Ankylosis	3	5	8
Caries	1	.....	1
Bunion	3	.....	3
Ostitis	1	.....	1
Periostitis .....	.....	1	1
Talipes	2	1	3
Spinae curvatura	5	61	66
Total	15	68	83
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus	1	.....	1
Acne	4	3	7
Cicatrix	10	2	12
Eczema	6	4	10
Eruptio cutis	26	18	44
Furunculus	1	.....	1
Herpes	1	.....	1
Lepra	1	.....	1
Pediculi	6	6	12
Psoriasis	1	2	3
Scabies	2	6	8
Ulcus	6	1	7
Unguis involutus	2	4	6
Total	67	46	113
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis	13	2	15
Total	13	2	15

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Table showing the number and causes of rejection of all persons examined, &c.—Continued.

Causes of rejection.	Over twenty- one years of age.	Twenty- one years of age and under.	Total.
	Men.	Boys.	
XII.—TUMORS.			
Tumor	8	1	9
Total	8	1	9
C.—POISONS.			
Alcoholismus	10	1	11
Colica pictonum	2		2
Total	12	1	13
D.—WOUNDS AND INJURIES.			
Fractura	3	1	4
Luxatio		2	2
Total	3	3	6
E.—DEFORMITIES AND DEFICIENCIES.			
Depressio calvaria	3	2	5
Deformitas coxarum	1	4	5
Deformitas cruris	4	2	6
Deformitas digiti	8	4	12
Deformitas humeri		1	1
Deformitas manus	3	4	7
Deformitas thoracis	5	37	42
Deformitas pedis	5		5
Genua arcuata	2	4	6
Genua introrsum flexa	2	6	8
Bursa patellæ amplificata		1	1
Exostosis	1		1
Total	34	65	99
F.—DEFECTIVE DEVELOPMENT.			
Debilitas	2	7	9
Morbo pulmonale prædispositio	50	69	119
Mensura thoracis defecta	17	75	92
Pondus corporis defectum	5	10	15
Statura corporis defecta	9	106	115
Statura et pondus defectæ		20	20
Omnes mensuræ defectæ	7	87	94
Total	90	374	464
No cause assigned	14	25	39
Total	14	25	39
Total number examined	6,452	2,251	8,703
Total number rejected	1,578	1,572	3,150

INSANE OF THE NAVY.

On the 30th September, 1882, there remained under treatment in the Government Hospital for the Insane :

Two lieutenant-commanders, 1 passed assistant surgeon, 1 passed assistant engineer, 1 assistant engineer, 1 late acting ensign, 1 paymaster's yeoman, 10 seamen, 1 late boatswain's mate, 2 ordinary seamen, 1 ordinary seaman (extra), 1 ordinary seaman (extra fireman), 1 seaman (extra fireman), 1 late seaman, 7 landsmen, 1 coal-heaver, 14 marines, 1 late marine, 1 beneficiary, 1 second-class boy, and 1 third-class boy; total

Admitted during the year ending September 30, 1883:

One lieutenant-commander, 1 ordinary seaman, 3 landsmen, 6 marines, 1 bugler (marine), 1 beneficiary, 1 third-class boy, 1 late third-class boy, 1 landsman.

Act of August 7, 1882; total

Total number treated during the year

Discharged during the year :

By recovery: 1 ordinary seaman, 1 landsman, 1 marine. By improvement: 1 paymaster's yeoman. On trial, 1 landsman. By death: 1 late landsman; total..... 6

Remaining at the end of the year :

Three lieutenant-commanders, 1 passed assistant surgeon, 1 passed assistant engineer, 1 assistant engineer, 1 late acting ensign, 1 late boatswain's mate, 10 seamen, 1 late seaman, 1 seaman (extra fireman), 2 ordinary seamen, 2 ordinary seamen (extra firemen), 8 landsmen, 1 coal-heaver, 19 marines, 1 late marine, 1 bugler (marine), 2 beneficiaries, 1 second-class boy, 2 third-class boys, 1 late third-class boy; total..... 60

ENTIRE FORCE.

The present report shows a decided gain in health of the Navy over last year.

There remained from last year 397 cases, which, in addition to those admitted during the current year, increased the total number that came under treatment to 13,263. These were disposed of in the following manner: 11,157 recovered and were restored to duty, 1,343 invalided to hospital, 225 invalided from the service, 90 died, and 448 were continued to the succeeding year.

The total number of sick-days, or time lost in consequence of disease and injury, reached 165,053, giving a daily average sick rate of 452.20. For the force afloat it was 216.58; at the hospitals, 179.49; and at the stations, 56.11. The average duration of treatment was 12.44 days.

As compared with the figures of the previous year, there is shown a decrease of 750 in the number of admissions, two less than the exact number invalided to hospital, 83 less than that invalided from the service, 7 deaths less. The daily average sick rate was reduced 5.13 $\frac{0}{0}$. There was a decrease by 1,874 in the sick-days; the average duration of treatment was pretty nearly the same, 12.44 days. It was 8.87 days for the force afloat, 44.23 for naval hospitals, and 7.13 days for the naval stations.

The different seasons had an important influence upon the number of sick, both ashore and afloat, the highest admission number, 3,394, being in the first quarter of the year, and the lowest, 3,111, in the third quarter, the same as last year. These facts are embraced in the following table :

Summary of the tables of the various squadrons and shore stations.

	Force afloat.	Naval hospitals.	Naval stations.	Grand aggregate.
Remaining from last year.....	176	175	46	397
Admitted:				
First quarter	2,220	316	858	3,394
Second quarter	2,164	311	666	3,141
Third quarter.....	2,312	296	503	3,111
Fourth quarter	2,039	383	798	3,220
Total	8,911	1,481	2,871	13,263
Discharged:				
Recovered and returned to duty	7,662	925	2,570	11,157
Invalided to hospitals	1,001	111	231	1,343
Invalided from the service.....	30	175	20	225
Died	44	36	10	90
Continued to succeeding year.....	174	234	40	448
Total	8,911	1,481	2,871	13,263
Total number of sick days	79,053	65,517	20,483	165,053
Average number of days under treatment	8.87	44.23	7.13	12.44
Daily average number of sick.....	216.58	179.49	56.11	452.20

FORCE AFLOAT.

The strength of the force afloat was 10,631, and corrected for time, 9,371, a decrease of 175 from the preceding year. The number of cases of disease and injuries treated amounted to 8,911, a ratio of $950.91\frac{0}{0}$; the number of cases per man was $.95\frac{0}{0}$; that is, if the cases were evenly distributed, nearly every man of the force would have been sick within the year. The amount of time lost by sickness was 79,053 days, which gives an average number of sick daily on board of 216.58, or a ratio of $23.11\frac{0}{0}$. The average duration of treatment was 8.87 days. Of the total number of those treated 7,662, a ratio of $859.83\frac{0}{0}$ were discharged to duty; 1,001 or $106.81\frac{0}{0}$ were invalided to hospital; 30 or $3.20\frac{0}{0}$ from the service, and 44 or $4.69\frac{0}{0}$ died. The number disabled by disease was 7,320, a ratio of $781.12\frac{0}{0}$, and by injury 1,501, a ratio of $169.79\frac{0}{0}$.

In comparison with the figures of the previous year they display a close approximation, yet it will be observed that there was a decrease of $42.49\frac{0}{0}$ of admissions, $.58\frac{0}{0}$ in invaliding from the service, while under the other heads the figures were slightly increased, as follows: $5.87\frac{0}{0}$ of those invalided to hospital; $1.66\frac{0}{0}$ of those dead. The sick days were increased 5,606, the daily average sick $1.66\frac{0}{0}$, and the average duration of treatment lengthened 1.13 days.

The reports of the German, Austrian, and English navies for the same period give respectively $1,440.0\frac{0}{0}$, $909.03\frac{0}{0}$, ———, for the admission rate, $180.06\frac{0}{0}$, $30.73\frac{0}{0}$, ———, for the invaliding rate, and $1.3\frac{0}{0}$, $6.14\frac{0}{0}$, ———, for the death rate.

In regard to the relative salubrity of the different stations, as is shown by the health of the squadrons, the North Atlantic stands first, as it has in the last four years, with an average daily sick rate of $18.23\frac{0}{0}$; next follows the Pacific, $24.88\frac{0}{0}$; then the Asiatic, $25.91\frac{0}{0}$, and finally the South Atlantic, $30.50\frac{0}{0}$, and the European, $34.83\frac{0}{0}$.

The invaliding rates in the different squadrons varied. The largest ratio sent to hospital was from the North Atlantic squadron, then the Pacific, and, in order, the Asiatic, South Atlantic, and European; pretty much in the same way as last year, from the fact that the vessels of the two former squadrons frequent ports where naval hospitals are located, while the other squadrons are compelled to treat the sick on shipboard. The death rate was largest in the European squadron, and, in numerical order, the South Atlantic, North Atlantic, Asiatic, and Pacific. These facts are grouped in the following table:

FORCE AFLOAT.

Stations.	Strength.	Number of cases of disease and injury.	Number of cases per man.	Number of days' sickness.	Average number of sick daily on board.	Ratio per M.
North Atlantic.....	4,714	4,211	.89	31,372	85.95	18.23
South Atlantic.....	611	687	1.12	6,806	18.64	30.50
Pacific.....	2,021	2,021	1.	18,360	50.30	24.88
European.....	1,031	978	.94	13,112	35.92	34.83
Asiatic.....	994	1,014	1.02	9,403	25.76	25.91
Total.....	9,371	8,911	.95	79,053	216.58	23.11

Force afloat—Continued.

Stations.	Invalided.				Died.	
	To the hospital.		From the service.			
	Number.	Ratio per M.	Number.	Ratio per M.	Number.	Ratio per M.
North Atlantic	642	136.19	16	3.39	19	4.03
South Atlantic	46	75.26	—	—	4	6.54
Pacific	181	89.55	11	5.44	8	3.95
European	47	45.58	2	1.93	9	8.72
Asiatic	85	85.51	1	1.006	4	4.02
Total	1,001	106.81	30	3.20	44	4.69

It will be seen from the subjoined table, which shows the causes determining the invaliding rate, that the leading group is that of constitutional diseases. This always stands at the head, not only in our Navy but in the foreign, and chiefly through the two leading diseases forming the group, syphilis and rheumatism. These are those which exercise the most disastrous influence upon the sailor's health, and but little and temporary amelioration can be effected until prostitution shall be made the special subject of legislation all over the world, as it has been in certain English and Japanese ports; and the effects of cold, dampness, ——— as far as may be by improvements in the construction, ventilation, and ——— of ships, and in the personal hygiene of the crews. Much, it is true, has within the last four years been accomplished in these directions in our Navy, but much more remains to be done to attain the desired results. It is believed that the influence of the progress in ventilation could be made evident by comparison of the sick reports before and after the introduction of the ventilating apparatus into our ships, but unfortunately there are no statistics anterior to this period with which those only lately compiled can be compared.

The causes of invaliding are arranged in the following table:

FORCE AFLOAT.

Classes of diseases and injuries.	Invalided.			
	To the hospital.	Ratio per M.	From the service.	Ratio per M.
Zymotic diseases	107	11.41	2	.21
Constitutional diseases	217	23.15	6	.64
Diseases of the nervous system	74	7.89	5	.53
Diseases of the eye	25	2.66	—	—
Diseases of the ear	6	.64	—	—
Diseases of the teeth	—	—	1	.10
Diseases of the circulatory system	32	3.41	1	.10
Diseases of the respiratory system	141	15.04	3	.32
Diseases of the digestive system	111	11.84	3	.32
Diseases of the genito-urinary system	76	8.11	4	.42
Diseases of the locomotive system	8	.85	1	.10
Diseases of the integumentary system	71	7.57	2	.21
Diseases of the absorbent system	30	3.20	—	—
Non-malignant tumors and cysts	4	.42	—	—
Poisons	10	1.06	—	—
Violent diseases and deaths	89	9.49	2	.21
Total	1,001	106.81	30	3.20

The death rate exceeds that of last year, as set forth in the following table, by 11. The group of injuries determined the largest number, next to this stands the group including the diseases of the respiratory organs, and nearly equaling this is the group of zymotic diseases. Last year the greatest number of deaths was caused by injuries, and the remaining cases were about equally distributed in the remaining classes.

FORCE AFLOAT.

Classes of diseases and injuries.	Deaths.	
	Cases.	Ratio per M.
Zymotic diseases	7	.74
Diseases of the nervous system	3	.32
Diseases of the circulatory system	3	.32
Diseases of the respiratory system	8	.85
Diseases of the digestive system	2	.21
Diseases of the genito-urinary system	3	.32
Non-malignant tumors and cysts	1	.10
Violent diseases and deaths	17	1.81
Total	44	4.69

There are marked differences in the character and prevalence of disease and injury in the different squadrons. Zymotic affections were most numerous represented in the South Atlantic and North Atlantic, and least so in the European and Asiatic, the same as last year. On the other hand, the Asiatic squadron leads off with the largest proportion of constitutional diseases, then the South Atlantic, Pacific, European, and North Atlantic. This showing is analogous to that of the preceding year except that the South Atlantic led.

Diseases of the nervous system were pretty evenly distributed, the European squadron leading the list with the largest number, and the Asiatic closing with the least. This was the case last year.

Diseases of the eye were more prevalent in the North Atlantic, and least so in the European. Last year the Asiatic furnished the largest number.

Diseases of the ear were principally noticed in the North Atlantic and Pacific squadrons, while the South Atlantic and European were quite free. This accords with the experience of the preceding year.

Diseases of the teeth were encountered most numerous in the Asiatic squadron; last year in the South Atlantic.

Diseases of the circulatory system were noticed more often in the South Atlantic squadron than in the Pacific and European squadrons, and less often in the Asiatic and North Atlantic squadrons. In preceding years the European squadron led and the South Atlantic displayed the greatest exemption.

Diseases of the respiratory system were more rife in the South Atlantic squadron than in the European and Pacific, and less so in the North Atlantic and Asiatic, being in great part in accord with the report of last year.

Diseases of the digestive system were encountered largely in the Asiatic squadron, then in the South Atlantic and European, and less so in the North Atlantic and Pacific. The figures are, throughout, nearly the same as in the preceding year.

Diseases of the genito-urinary system were, for the first time in four years, found in the Asiatic squadron in the largest numbers instead of in the European. The latter squadron, however, takes second rank, while the Pacific and the Atlantic squadrons follow with less numbers.

Diseases of the locomotive system were furnished most numerous by the South Atlantic, European, and North Atlantic squadrons, and less so by the others—the reverse of last year.

Diseases of the integumentary system occurred more numerous in the Asiatic squadron, and less so in the Pacific.

Diseases of the absorbent glands were noticeably prominent in the Pacific and Asiatic squadrons, as occurred last year.

Non-malignant tumors and cysts were pretty evenly distributed in the various squadrons.

Diseases falling under the class of poisons were most often met with in the Asiatic squadron, as was the case last year, and less so in the North Atlantic and Pacific squadrons.

Violent diseases and deaths are represented by larger figures as occurring in the South Atlantic and Pacific squadrons; then, in order, followed the Asiatic, North Atlantic, and European squadrons. This was the case the two preceding years.

The subjoined table presents these facts:

Classes of diseases and injuries.	North Atlantic.		South Atlantic.		Pacific.		European.		Asiatic.	
	1881.	1882.	1881.	1882.	1881.	1882.	1881.	1882.	1881.	1882.
Zymotic diseases	152.6	132.15	77.10	139.11	114.31	124.19	128.0	81.47	128.54	99.59
Constitutional diseases	90.0	100.76	204.81	147.29	151.31	146.95	147.2	136.76	119.09	155.94
Diseases of the nervous system	36.4	53.66	33.73	52.37	60.99	56.90	63.2	64.01	34.02	39.23
Diseases of the eye	12.6	15.91	7.24	8.18	16.42	13.85	12.8	3.87	17.95	13.07
Diseases of the ear	4.2	6.99	7.24	.....	11.14	6.92	3.2	.....	4.72	3.01
Diseases of the teeth	1.6	1.69	4.81	.....	1.17	2.47	4.8	.....	3.78	3.01
Diseases of the circulatory system	7.4	6.78	2.40	13.09	6.45	9.89	8.0	8.72	5.67	6.03
Diseases of the respiratory system	106.2	89.52	120.48	150.57	102.05	109.84	171.2	129.00	68.99	63.38
Diseases of the digestive system	155.4	134.70	142.16	144.02	140.76	127.65	204.0	143.54	202.26	160.96
Diseases of the genito-urinary system	49.0	56.00	38.55	55.64	71.54	72.73	97.6	83.11	96.40	99.59
Diseases of the locomotive system	5.2	4.61	2.40	9.82	4.10	2.96	3.2	4.84	8.05	3.01
Diseases of the integumentary system	102.2	102.46	110.84	119.47	83.87	91.53	119.2	100.87	106.08	131.78
Diseases of the absorbent system	11.8	12.72	21.68	19.63	22.28	27.70	23.2	19.39	35.91	25.15
Non-malignant tumors and cysts	.6	2.54	.....	.....	1.75	1.48	1.6	2.90	.94	3.01
Poisons	18.2	16.96	33.73	27.82	34.60	16.32	18.4	18.42	40.64	36.21
Violent diseases and deaths	158.4	156.34	236.14	237.31	192.37	187.03	228.0	150.33	148.39	177.06
Morbi simulati .....	.....	.....	.....	.....	1.75	1.48	.....	.....	.....	.....
Total	911.8	893.29	1,043.35	1,124.38	1,017.00	1,000.00	1,233.6	948.59	1,022.68	1,020.12

GENERAL DISEASES.

Of the 8,911 cases that came under treatment, 7,320, a ratio of $781.12\frac{0}{0}$, were due to disease, and 1,591, a ratio of $169.79\frac{0}{0}$, to injuries. Of the diseases, 2,300 belonged to the division of general diseases and 6,611 to local diseases, a proportion a little less than three to one, which was the case the preceding year.

ZYMOTIC DISEASES.

There were returned 1,142 cases of zymotic diseases, a ratio of $121.86\frac{0}{0}$, or $14.63\frac{0}{0}$ less than last year. The loss of time from this cause was 6,870 days, 326 days less than the preceding year. The average duration of treatment was 6.01 days and the daily average number of sick $2\frac{0}{0}$. Of these, 1,015, or $108.31\frac{0}{0}$, recovered; 107 ($11.41\frac{0}{0}$) were transferred to hospital; 2 ($.21\frac{0}{0}$) were discharged from the service; 7 ($.74\frac{0}{0}$) died, and 11 continued to succeeding year.

In the English navy the admission ratio was ———, the invaliding, ———, and the death ———. In the German navy the zymotic and constitutional diseases are classed together, and the ratio of admissions was $178.06\frac{0}{0}$, the average daily sick $5.90\frac{0}{0}$, and the average duration of treatment 12 days. The Austrian report gives for admissions $74.42\frac{0}{0}$, and the average duration of treatment 15.5.

Catarrhus epidemicus.—This disease yielded 3 cases, $.32\frac{0}{0}$, against $.62\frac{0}{0}$ the prior year. The time lost on shipboard was only 6 days. One case was transferred to hospital; the others returned to duty.

Erysipelas.—There were 13 cases, $1.38\frac{0}{0}$, against $1.57\frac{0}{0}$ last year. The number of sick days was 83, and the average duration of treatment 6.38 days. The daily average number of sick was $.02\frac{0}{0}$. Ten recovered on shipboard, and 3 were sent to hospital.

Febricula.—Grouped under this heading are found 77 cases, a ratio of $8.21\frac{0}{0}$ against $9.53\frac{0}{0}$ the preceding year. The number of sick days reached 323, giving a daily average number sick of $.09\frac{0}{0}$. The average number of days under treatment was 4.19. Of these, 75 ($.8\frac{0}{0}$) were returned to duty, and 2 ($.21\frac{0}{0}$) were sent to hospital.

Febris cerebro spinalis.—Only one case found place in the returns, which died after a brief illness of four days.

Febris continua simplex.—One hundred and two cases are recorded, a ratio of $10.88\frac{0}{0}$ against $13.93\frac{0}{0}$ the preceding year. The number of sick days was 846, the daily average number sick $.24\frac{0}{0}$, and the average duration of treatment 8.29 days; 93 of this number, a ratio of $9.91\frac{0}{0}$, recovered; 8 were invalided to hospital, and one continued to the next year.

Febris enterica.—There were 20 cases, a ratio of $2.13\frac{0}{0}$ against $1.15\frac{0}{0}$ last year. The number of sick days was 507, the average number of sick daily $.14\frac{0}{0}$, and the average number of days under treatment 25.35. Of these, 5 ($.53\frac{0}{0}$) recovered on shipboard, 8 ($.85\frac{0}{0}$) were invalided to hospital, 4 ($.42\frac{0}{0}$) died, and 3 continued.

Febris intermittens.—This disease furnished 638 cases, a ratio of $68.08\frac{0}{0}$ against $72.07\frac{0}{0}$ last year. The number of sick days reached 2,708, the daily average sick $.79\frac{0}{0}$, and the average duration of treatment 4.24 days. Of these, 593 ($63.28\frac{0}{0}$) recovered on shipboard, 39 ($4.16\frac{0}{0}$) invalided to hospital, 1 discharged from service, 2 died, and 3 continued to next year.

Febris remittens.—This disease yielded 138 cases, a ratio of $14.72\frac{0}{0}$, against $13.82\frac{0}{0}$ last year. The number of sick days was 1,293, the average daily sick $37\frac{0}{0}$, the average duration of treatment 9.36 days. There

were 118 ($12.59\frac{0}{0}$) discharged to duty 17 ($1.81\frac{0}{0}$) invalided to hospital, 1 from the service, and 2 continued.

Morbilli.—There were 7 cases ($.74\frac{0}{0}$) against $3.87\frac{0}{0}$ last year. The number of sick days was 7. All were transferred to hospital.

Parotitis.—There were only 4 cases, a ratio of $.42\frac{0}{0}$ against $7.22\frac{0}{0}$ last year. The number of sick days was 12; 2 cases were treated on shipboard, and 2 were transferred to hospital.

Roseola.—There were 3 cases, a ratio of $32\frac{0}{0}$ against $83\frac{0}{0}$ last year. The number of sick days reached 91, the average number sick daily $.02\frac{0}{0}$, the average number of days under treatment $30.33\frac{0}{0}$. All these cases were treated on board ship.

Rötheln.—Two cases were reported, $21\frac{0}{0}$. The number of sick days was 8, the average duration of treatment 4 days. One was discharged to duty, and the other transferred to hospital.

Scarlatina.—There were 5 cases returned, a ratio of $.53\frac{0}{0}$. The number of sick days was 5. All were transferred to hospital.

Vaccina.—There were 114 cases of this disease, a ratio of $12.16\frac{0}{0}$, against $9.95\frac{0}{0}$ last year. The number of sick days reached 876, the average number daily sick $.25\frac{0}{0}$, and the average number of days under treatment 7.68. Of these, 111 ($11.84\frac{0}{0}$) were treated on shipboard, 1 was transferred to hospital, and 2 continued to next year.

The results of vaccination in the whole service is set forth in the following table, fresh bovine virus being used :

	Presenting good cicatrices.		No evidence of previous vaccination.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Total.....	2, 573	4, 469	614	457	80	201	8, 394
Per cent. of cases	83. 8		12. 7		3. 3		39. 1
Per cent. of successful.....	36. 5		57. 3		28. 4		

Varicella.—There was but one case recorded, which recovered on shipboard.

Variola.—Of this disease there were 8 cases, a ratio of $.85\frac{0}{0}$ against $.73\frac{0}{0}$ last year. The number of sick days was 90, and the average duration of treatment 11.25 days. Two cases were treated on shipboard and 6 were sent to hospital.

Varioloides.—There were 6 cases reported, a ratio of $.64\frac{0}{0}$ against $.31\frac{0}{0}$ last year. All recovered on shipboard.

CONSTITUTIONAL DISEASES.

In this division of diseases were reported 1,158 cases, a ratio of $123.57\frac{0}{0}$ against $116.80\frac{0}{0}$ the preceding year. The number of sick days was 14,506, which furnishes a daily average sick list of $4.24\frac{0}{0}$, a slight increase over the previous year. The average duration of treatment was 12.52 days. Of these cases, 903, a ratio of $96.36\frac{0}{0}$, were returned to duty; 217, a ratio of $23.15\frac{0}{0}$, were transferred to hospital; 6 ($.64\frac{0}{0}$), were discharged from the service, and 32 continued.

The English reports show an admission ratio of — $\frac{0}{0}$; invaliding, — $\frac{0}{0}$; death, — $\frac{0}{0}$.

Adynamia.—This disease yielded 100 cases, a ratio of $10.67\frac{0}{0}$, against

11.41 $\frac{0}{100}$ the preceding year. The amount of time lost was 1,156 days; the average number daily sick .33 $\frac{0}{100}$, and the average duration of treatment 11.56 days. Of the whole number, 67 (7.17 $\frac{0}{100}$) were returned to duty; 31 (3.30 $\frac{0}{100}$) were transferred to hospital, and 2 continued to next year.

Anæmia.—There were 8 cases, .85 $\frac{0}{100}$, against .20 $\frac{0}{100}$ the previous year. The time lost was 65 days; the daily average number sick .01 $\frac{0}{100}$, and the average duration of treatment 8.12 days. Five of the cases (.53 $\frac{0}{100}$) were returned to duty, and 3 (.32 $\frac{0}{100}$) transferred to hospital.

Carcinoma.—Only one case came under treatment, which was transferred to hospital.

Diabetes.—There were 2 cases returned, against 1 the preceding year. One was discharged to duty, and the other continued.

Hydrops.—Under this title are found 3 cases, a ratio of .32 $\frac{0}{100}$, against .52 $\frac{0}{100}$ last year. The number of sick days reached 55, and the average duration of treatment 18.33 days. All were discharged to duty.

Hypertrophia.—But one case finds place in the report, the same as the preceding year. It was transferred to hospital.

Lumbago.—This affection furnished 79 cases, a ratio of 8.42 $\frac{0}{100}$, against 5.97 $\frac{0}{100}$ last year. The number of sick days was 533; the daily average sick .15 $\frac{0}{100}$, and the average duration of treatment 6.74 days. Of these, 70 were discharged cured, a ratio of 7.47 $\frac{0}{100}$; 5 (.53 $\frac{0}{100}$) were transferred to hospital, and 4 continued.

Podagra.—We find 10 cases of this disease, a ratio of 1.06 $\frac{0}{100}$, against 1.15 $\frac{0}{100}$ the preceding year. The sick days reached 48; the average daily sick .01 $\frac{0}{100}$, and the average time under treatment 4.8 days. Nine (.96 $\frac{0}{100}$) were restored to duty, and one transferred for hospital treatment.

Rheumatismus acutus.—There were 268 cases, a ratio of 28.59 $\frac{0}{100}$ against 32.16 $\frac{0}{100}$ the previous year. The total number of sick days was 2,836, the daily average sick list .82 $\frac{0}{100}$, and the average duration of treatment 10.57 days. The disposition of these cases was as follows: Two hundred and twenty-six, a ratio of 24.11 $\frac{0}{100}$, were returned to duty; 37 (3.95 $\frac{0}{100}$) transferred to hospital; 1 (.10 $\frac{0}{100}$) invalided from service, and 4 continued to next year.

Rheumatismus chronicus.—There were 250 cases of this form of the disease, a ratio of 26.67 $\frac{0}{100}$ against 27.55 $\frac{0}{100}$ the previous year. The number of sick days amounted to 2,581; the daily average sick .75 $\frac{0}{100}$, and the average duration of treatment 10.32 days. Of the whole number, 197 cases (21.07 $\frac{0}{100}$) were returned to duty; 45 (4.80 $\frac{0}{100}$) transferred to hospital; 1 (.10 $\frac{0}{100}$) invalided from the service, and 7 continued to next year.

Rheumatismus gonorrhœicus.—There were 3 cases reported (.32 $\frac{0}{100}$), the same figure as last year. One of these cases was restored to duty and 2 transferred to hospital.

Scrofula.—There were 3 cases returned, a ratio of .32 $\frac{0}{100}$. One was returned to duty and 2 invalided to hospital.

Senectus.—Four cases, .42 $\frac{0}{100}$ against .20 $\frac{0}{100}$ the previous year, were returned, showing that the practice of shipping old sailors in special rating has not yet been abandoned, although it is a well-known fact that they rarely perform their duties.

Syphilis primitiva.—There were 194 cases recorded, a ratio of 20.70 against 17.91 $\frac{0}{100}$ the previous year. The time lost was 3,529 days; the average daily sick, 1.03 $\frac{0}{100}$, and the average duration of treatment 18.19 days. Of this number, 155 (16.54 $\frac{0}{100}$) were returned to duty; 35 (3.74 $\frac{0}{100}$) transferred to hospital, and 4 continued to next year.

Syphilis consecutiva.—This form of disease furnished 229 cases, a ratio

of $24.43\frac{0}{0}$ against $18.54\frac{0}{0}$ the previous year. The number of sick days was 3,426; the daily average sick list $1\frac{0}{0}$, and the average duration of treatment, 14.96 days. The disposition of these cases was as follows: 164 ($17.50\frac{0}{0}$) were returned to duty; 52 ($5.54\frac{0}{0}$) transferred to hospital; 3 ($32\frac{0}{0}$) invalided from the service, and 10 continued to the next year.

Torticollis.—There were 3 cases of this affection returned ($.32\frac{0}{0}$); all of which were returned to duty.

LOCAL DISEASES.

The number of cases received under the various groups falling under the division of local diseases amounted to 6,611, a ratio of $705.47\frac{0}{0}$ against $740.11\frac{0}{0}$ last year.

DISEASES OF THE NERVOUS SYSTEM.

Under this group fell 505 cases, a ratio of $53.88\frac{0}{0}$ against $43.99\frac{0}{0}$ the previous year. The total number of sick days was 4117; the daily average sick list $1.20\frac{0}{0}$, and the average duration of treatment, 8.13 days. Of this number 415, a ratio of $44.28\frac{0}{0}$, were returned to duty; 74 ($7.89\frac{0}{0}$) were transferred to hospital; 5 ($.53\frac{0}{0}$) invalided from the service; 3 ($.32\frac{0}{0}$) died, and 8 were continued.

The admission rates in the English navy were $\frac{0}{0}$, the invaliding rates were $\frac{0}{0}$, and the death rates $\frac{0}{0}$. In the German navy the admission rates were $4.5\frac{0}{0}$, and the average duration of treatment 24.4 days.

Apoplexia.—There were 3 cases returned ($.32\frac{0}{0}$) against $.20\frac{0}{0}$ the previous year. The number of sick days was 20; the average duration of treatment 6.66 days. Of these, 2 were discharged to duty and 1 died.

Cephalalgia.—There were 105 cases returned, a ratio of $11.20\frac{0}{0}$ against $9.84\frac{0}{0}$ the preceding year. The sick days amounted to 275; the daily average sick $.08\frac{0}{0}$, and the average duration of treatment 2.71 days. Of these, 103 ($10.99\frac{0}{0}$) were returned to duty and 2 invalided to hospital.

Cerebritis.—One case of this affection was reported which was transferred to hospital.

Chorea.—There were 2 cases returned ($.21\frac{0}{0}$), both were transferred to hospital. The previous year but one case was returned.

Convulsio.—There were 5 cases reported ($.53\frac{0}{0}$), of which 2 were returned to duty and 3 transferred to hospital.

Dementia.—Fifteen cases were reported, a ratio of $1.59\frac{0}{0}$ against $.62\frac{0}{0}$ the previous year. The sick days numbered 551; the average daily sick was $.16\frac{0}{0}$, and the average duration of treatment 3.67 days. Of these, 2 were returned to duty, 12 ($1.27\frac{0}{0}$) transferred to hospital, and 1 invalided from service.

Epilepsia.—There were 22 cases returned, a ratio of $2.34\frac{0}{0}$ against $2.93\frac{0}{0}$ last year. The time lost was 381 days; the daily average sick $.11\frac{0}{0}$, and the average duration of treatment 17.31 days. Of these, 9 ($.96\frac{0}{0}$) were discharged to duty, 9 ($.96\frac{0}{0}$) transferred to hospital, and 4 ($.42\frac{0}{0}$) invalided from the service.

Hysteria.—Seven cases of this affection were returned, a ratio of $.74\frac{0}{0}$ against $.41\frac{0}{0}$ last year. The sick days reached 35; the average duration of treatment 5 days. Four of the cases were returned to duty and 3 were sent to hospital.

Insolatio.—There were 9 cases returned, a ratio of $.96\frac{0}{0}$ against $1.25\frac{0}{0}$ the previous year. The time lost was 42 days; the average number sick daily $.01\frac{0}{0}$, and the average duration of treatment 4.66 days. All recovered.

Insomnia.—There were 3 cases of this affection $.32\frac{0}{0}$. One was discharged to duty, and 2 transferred to the hospital.

Mania.—Seven cases are recorded, $.74\frac{0}{0}$. The number of sick days was 180; the average number daily sick $.05\frac{0}{0}$, and the average duration of treatment 25.72 days. Of these 2 were discharged to duty and 5 invalided to hospital.

Melancholia.—There were 7 cases returned, a ratio of $.74\frac{0}{0}$ against $.94\frac{0}{0}$ the previous year. The number of sick days was 224; the average number daily sick $.06\frac{0}{0}$, and the average duration of treatment 32 days. Of these 2 were discharged to duty, and 5 invalided to hospital.

Meningitis.—There occurred 6 cases, a ratio of $.64\frac{0}{0}$ against $31\frac{0}{0}$ the previous year. The number of sick days reached 162; the average number daily sick $.04\frac{0}{0}$, and the average duration of treatment 27 days. Of these 4 ($.42\frac{0}{0}$) were invalided to hospital, and 2 ($.21\frac{0}{0}$) died.

Nausea marina.—There were reported 73 cases, a ratio of $7.78\frac{0}{0}$ against $3.56\frac{0}{0}$ the previous year. The sick days amounted to 224; the daily average number of sick $.06\frac{0}{0}$, and the average duration of treatment 3.10 days. All were returned to duty.

Neuralgia.—Of this disease there were observed 172 cases, or $17.68\frac{0}{0}$ against $18.12\frac{0}{0}$ the previous year. The time lost was 1,344 days; the daily average number sick $.39\frac{0}{0}$, and the average duration of treatment 7.81 days. Of the whole number 151, or $16.14\frac{0}{0}$ were returned to duty; 16, or $1.69\frac{0}{0}$, transferred to hospital, and 5 continued.

Neuritis.—One case occurred, which, after treatment of 25 days, recovered.

Paralysis.—This disease was noticed in 13 cases, or $1.38\frac{0}{0}$ against $1.25\frac{0}{0}$ the previous year. The sick days reached 268; the daily average number sick $.07\frac{0}{0}$, and the average duration of treatment 20.61 days. Of this number 7 cases were returned to duty, and 6 transferred to hospital.

Pleurodynia.—The records show 22 cases, or $2.34\frac{0}{0}$ against $73\frac{0}{0}$ the previous year. The number of sick days was 100; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 4.54 days. Of these 18, or $1.71\frac{0}{0}$, were discharged to duty; 3, or $32\frac{0}{0}$, transferred to hospital, and 1 continued.

Sciatica.—There were 3 cases returned, a ratio of $.32\frac{0}{0}$. The sick days were 84; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 28 days. The whole number were returned to duty.

Vertigo.—There were 27 cases reported, a ratio of $2.87\frac{0}{0}$, against $1.99\frac{0}{0}$ last year. The sick days numbered 181; the daily average number sick $.05\frac{0}{0}$, and the average duration of treatment 6.70 days. Of these, 24 were returned to duty, 1 transferred to hospital, and 2 continued.

DISEASES OF THE EYE.

This class furnished 122 cases, a ratio of $13.01\frac{0}{0}$ against $13.82\frac{0}{0}$ the previous year. The number of sick days was 1,019; the average number sick daily $.29\frac{0}{0}$, and the average duration of treatment 8.27 days. Of these, 94 ($10.03\frac{0}{0}$) were discharged recovered, 25 ($2.66\frac{0}{0}$) transferred to hospital, and 3 continued.

Amaurosis.—Under this heading 3 cases were returned, $.32\frac{0}{0}$, against $.41\frac{0}{0}$ last year. The number of sick days was 41; the daily average number sick $.01\frac{0}{0}$, and the average number of days under treatment 13.66. One case was returned to duty, 1 transferred to hospital, and 1 continued.

Asthenopia.—This affection furnished 3 cases, a ratio of $.32\frac{0}{0}$, against $.41\frac{0}{0}$ the preceding year. One was returned to duty, and 2 transferred to hospital.

Conjunctivitis.—There were 69 cases reported, a ratio of $8.20\frac{0}{0}$ against $8.06\frac{0}{0}$ last year. The time lost was 413 days; the daily average number of sick $.12\frac{0}{0}$, and the average duration of treatment 5.98 days. Of these, 63 ($7.56\frac{0}{0}$) were discharged cured, 5 transferred to hospital, and 1 continued.

Hemeralopia.—Two cases ($.21\frac{0}{0}$) were reported, of which 1 recovered and the other was transferred to hospital.

Hordeolum.—Four cases came under notice, $.42\frac{0}{0}$ against $1.15\frac{0}{0}$ the previous year. They were under treatment on an average 3.5 days. All recovered on board.

Iritis.—Fourteen cases of this disease are recorded, $1.40\frac{0}{0}$ against $.94\frac{0}{0}$ last year. The time lost was 151 days; the daily average number sick, $.04\frac{0}{0}$, and the average duration of treatment 10.78 days; 12 of these ($1.18\frac{0}{0}$) were returned to duty and 2 transferred to hospital.

Keratitis.—This supplied 1 case, $.10\frac{0}{0}$ against $.52\frac{0}{0}$ the previous year. After 39 days' treatment the case was returned to duty.

Ophthalmia.—This affection gave 3 cases, a ratio of $.32\frac{0}{0}$. One recovered on shipboard, and 2 transferred to hospital.

Ophthalmia gonorrhoeica.—There was 1 case, which recovered after 22 days' treatment.

Ophthalmia tarsi.—There was 1 case which was transferred to hospital.

Retinitis.—Nine cases came under observation, a ratio of $.96\frac{0}{0}$. The number of sick days was 162; the daily average sick $.04\frac{0}{0}$ and the average duration of treatment 18 days. Three were returned to duty, 5 transferred to hospital, and 1 continued.

Sclerotitis.—This disease found 1 case which was returned to duty.

Ulcus cornea.—There were 9 cases returned, a ratio of $.96\frac{0}{0}$ against $.41\frac{0}{0}$ last year. The time lost was 104 days; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 11.55 days. Four cases ($.42\frac{0}{0}$) were returned to duty, and 5 were transferred to hospital.

DISEASES OF THE EAR.

The number of cases of diseases of the ear reached the number of 50, a ratio of $5.33\frac{0}{0}$ against $5.44\frac{0}{0}$ last year. The number of sick days reached 321; the average number daily sick $.09\frac{0}{0}$, and the average duration of treatment $6.45\frac{0}{0}$ days. Forty-four of these cases, a ratio of $4.69\frac{0}{0}$ were discharged to duty, and 6 ($.64\frac{0}{0}$) invalided to hospital.

Otalgia.—This affection gave 10 cases, $1.06\frac{0}{0}$ against $.84\frac{0}{0}$ the previous year. The sick days were 53; the daily average sick $.01\frac{0}{0}$, and the average duration of treatment 5.3 days. Nine cases were returned to duty, and 1 transferred to hospital.

Otitis.—There were 17 cases observed, a ratio of $1.80\frac{0}{0}$ against $2.61\frac{0}{0}$ the previous year. The sick days were 83; the daily average number of sick $.02\frac{0}{0}$, and the average duration of treatment 4.97 days. Fifteen of this number were returned to duty, and 2 transferred to hospital.

Otorrhœa.—This disease yielded 19 cases, a ratio of $2.01\frac{0}{0}$ against $1.67\frac{0}{0}$ the preceding year. The time lost was 169 days; the daily average number sick $.04\frac{0}{0}$, and the average duration of treatment 8.89 days. Of this number 18 were returned to duty, and 1 transferred to hospital.

Surditas.—There were 4 cases returned, $.42\frac{0}{0}$, against $.31\frac{0}{0}$ last year. Two were returned to duty, and 2 sent to hospital.

DISEASES OF THE TEETH.

This group of diseases is always meagre in number from the great care taken in recruiting, so that few enter with the teeth much damaged. There were only 17 cases that came upon the list, a ratio of $1.80\frac{0}{0}$ against $2.30\frac{0}{0}$ last year. The time lost was 46 days; the average duration of treatment 2.7 days. Sixteen were returned to duty, and 1 invalided from the service.

Odontalgia.—Of this disease there were 15 cases ($1.59\frac{0}{0}$); 14 returned to duty and 1 invalided from the service.

Parulis.—There were 2 cases, both of which were returned to duty.

DISEASES OF THE CIRCULATORY SYSTEM.

There were 75 cases which fell under this disease, a ratio of $.8\frac{0}{0}$ against $7.12\frac{0}{0}$ last year. The number of sick days reached 995; the daily average number sick $.29\frac{0}{0}$; and the average duration of treatment 13.26 days. Thirty-seven of these cases ($3.94\frac{0}{0}$) were returned to duty; 32 ($3.40\frac{0}{0}$) transferred to hospital; 1 invalided from the service, and 2 continued.

Aneurysma.—There were 8 cases recorded, a ratio of $.85\frac{0}{0}$ against $.31\frac{0}{0}$ the previous year. The sick days reached 253; the daily average number sick $.07\frac{0}{0}$, and the average duration of treatment, 31.62 days. Of these, 6 were invalided to hospital and 2 died.

Angina pectoris.—There were 3 cases returned, $.32\frac{0}{0}$ against $.84\frac{0}{0}$ last year. The time lost was 34 days, and the average duration of treatment 11.33 days. All these were transferred to hospital.

Dilatatio cordis.—One case occurred, which was sent to duty.

Hypertrophica cordis.—One case was returned, which was transferred to hospital.

Morbi valvularum cordis.—This disease occurred in 12 cases, a ratio of $1.28\frac{0}{0}$ against $1.25\frac{0}{0}$ last year. The number of sick days was 97; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 8.08 days. Of these 3 were sent to duty, 7 invalided to hospital, 1 invalided from service, and 1 died.

Palpitatio.—This affection gave 42 cases, a ratio of $4.48\frac{0}{0}$ against $3.45\frac{0}{0}$ last year. The time lost was 560 days; the average daily sick $.16\frac{0}{0}$, and the average duration of treatment 13.33 days. Of these, 27 were discharged to duty, 13 invalided to hospital, and 2 continued.

Pericarditis.—One case was returned, which was transferred to hospital.

Phlebitis.—There were 3 cases of this disease, a ratio of $.32\frac{0}{0}$ against $.20\frac{0}{0}$ last year. All were returned to duty. The average duration of treatment was 5 days.

Syncope.—Two cases are found in the returns under this head, a ratio of $.21\frac{0}{0}$ against $.52\frac{0}{0}$ last year. Both recovered on shipboard.

Varix.—Of this disease there were 2 cases. One recovered on board, and 1 was transferred to hospital.

DISEASES OF THE RESPIRATORY SYSTEM.

In this group are returned 932 cases, a ratio of $99.45\frac{0}{0}$, against $112.19\frac{0}{0}$ last year, which is a marked decrease. The total number of sick days was 9,389; the daily average number sick, $2.74\frac{0}{0}$, and the average number of days under treatment 10.07. Of the above, 757, or $80.78\frac{0}{0}$, were returned to duty; 141, or $15.04\frac{0}{0}$, transferred to hospital; 3, or $.32\frac{0}{0}$, invalided from service; 8, or $.85\frac{0}{0}$, died, and 23 continued to next year.

In the English navy the admission rate was $\frac{0}{00}$; the invaliding rate $\frac{0}{00}$, and the death rate $\frac{0}{00}$. In the German navy the admission rate was $34.30\frac{0}{00}$; the average duration of treatment 17.6 days. In the Austrian navy the admission rate was $147.15\frac{0}{00}$; the average duration of treatment was 16.4 days.

Asthma.—There were 26 cases returned, a ratio of $2.78\frac{0}{00}$ against $.73\frac{0}{00}$ last year, a very large increase. The number of sick days was 253; the daily average sick rate $.07\frac{0}{00}$, and the average duration of treatment 9.73 days. Of these, 18 ($1.91\frac{0}{00}$) were returned to duty; 5 ($.53\frac{0}{00}$) invalided to hospital; 1 invalided from the service, and 2 continued.

Bronchitis acuta.—There were 279 cases reported, a ratio of $29.76\frac{0}{00}$ against $31.33\frac{0}{00}$ the previous year. The number of sick days reached 2,418; the daily average sick rate $.70\frac{0}{00}$, and the average duration of treatment 8.66 days. Of these, 245, or $26.14\frac{0}{00}$, were discharged to duty; 25, or $2.68\frac{0}{00}$, transferred to hospital, and 9 continued to next year.

Bronchitis chronica.—Of this affection there were reported 68 cases, a ratio of $7.25\frac{0}{00}$ against $7.12\frac{0}{00}$ the previous year. The number of sick days amounted to 1.133; the daily average sick rate $.33\frac{0}{00}$, and the average duration of treatment 16.66 days. Of these, 35, or $3.73\frac{0}{00}$, were returned to duty; 28, or $2.97\frac{0}{00}$, transferred to hospital, and 5 continued.

Catarrhus.—There were returned 386 cases, $41.19\frac{0}{00}$ against $53.11\frac{0}{00}$, the preceding year. The time lost amounted to 2,191 days; the daily average number sick was $.64\frac{0}{00}$, and the average duration of treatment 5.67 days. Of these, 376, or $40.13\frac{0}{00}$, were returned to duty; 4, or $.42\frac{0}{00}$, transferred to hospital; 1 invalided from service, and 5 continued.

Epistaxis.—There were 2 cases returned, 1 of which was returned to duty, and 1 transferred to hospital.

Hæmoptysis.—Nine cases are found recorded, $.96\frac{0}{00}$ against $2.09\frac{0}{00}$ last year. The number of days lost was 277; the daily average number sick was $.08\frac{0}{00}$, and the average duration of treatment 30.77 days. Of these, 7 were returned to duty, and 2 transferred to hospital.

Laryngitis.—There were 27 cases of this malady, $2.87\frac{0}{00}$ against $1.72\frac{0}{00}$ the previous year. The number of sick days reached 204; the daily average number sick $.05\frac{0}{00}$, and the average duration of treatment 7.55 days. Of these, 23, or $2.45\frac{0}{00}$, were returned to duty, and 4, or $.42\frac{0}{00}$, transferred to hospital.

Phthisis pneumonia acuta.—Six cases were reported, a ratio of $.64\frac{0}{00}$ against $.31\frac{0}{00}$ last year. The time lost was 192 days; the daily average number sick $.05\frac{0}{00}$, and the average duration of treatment 32 days. Two were returned to duty, and 4 were transferred to hospital.

Phthisis pneumonia chronica.—There were 53 cases recorded, a ratio of $5.65\frac{0}{00}$ against $4.93\frac{0}{00}$ last year. The number of days lost reached 1,393; the daily average number sick was $.40\frac{0}{00}$, and the average duration of treatment 26.28 days. Six of these, $.64\frac{0}{00}$, were returned to duty; 44, or $4.70\frac{0}{00}$, were transferred to hospital; 1, or $.10\frac{0}{00}$, were invalided from the service; 1 died, and 1 continued.

Pleuritis.—Thirty five cases were returned, a ratio of $3.73\frac{0}{00}$ against $4.83\frac{0}{00}$ last year. The number of sick days was 637; the average number sick daily was $.18\frac{0}{00}$, and the average duration of treatment 18.2 days. Of these cases, 26, or $2.78\frac{0}{00}$, were returned to duty, and 9, or $.96\frac{0}{00}$, transferred to hospital.

Pneumonia.—Of this disease, there were 41 cases, a ratio of $4.38\frac{0}{00}$, against $4.51\frac{0}{00}$ last year. The number of sick days was 689; the daily average number of sick $20\frac{0}{00}$, and the average duration of treatment 16.80 days. Of these 18, or $1.90\frac{0}{00}$ were returned to duty, 15, or 1.57 , transferred to hospital, 7, or $.74$, died, and 1 continued.

DISEASES OF THE DIGESTIVE SYSTEM.

The total number of cases of these diseases furnished by the returns was 1,289, or $137.5\frac{0}{0}$ against $163.85\frac{0}{0}$, which is a marked decrease. The total number of sick days was 7,131; the daily average number sick $2.08\frac{0}{0}$, and the average duration of treatment 5.53 days. The disposition of these cases was as follows: 1,162, or $123.99\frac{0}{0}$, sent to duty; 111, or $11.84\frac{0}{0}$, transferred to hospital; 3, or $.32\frac{0}{0}$, invalided from service; 2, or $.21\frac{0}{0}$, died, and 11 continued to next year.

The English reports show an admission rate of $\frac{0}{0}$; invaliding $\frac{0}{0}$; death $\frac{0}{0}$. The German reports show admission $116.6\frac{0}{0}$, and the average duration of treatment 6.4 days. The Austrian reports show admission $189.14\frac{0}{0}$, and the average duration of treatment 6.5 days.

Ascites.—There was a single case, which was transferred to hospital.

Cholera morbus.—Of this affection there were 52 cases, a ratio of $5.24\frac{0}{0}$ against $11.94\frac{0}{0}$ last year. The time lost was 1.31 days; the daily average number of sick was $.03\frac{0}{0}$, and the average duration of treatment 2.23 days. All recovered on shipboard.

Colica.—This disease furnished 141 cases, a ratio of $15.04\frac{0}{0}$ against $16.65\frac{0}{0}$ last year. The number of sick days was 424; the daily average number sick $.12\frac{0}{0}$, and the average duration of treatment 3 days. Of these 139, or $14.83\frac{0}{0}$, were restored to duty; 1 invalided to hospital, and 1 continued.

Congestio hepatis.—There were 10 cases returned, a ratio of $1.06\frac{0}{0}$ against $.31\frac{0}{0}$ last year. The number of sick days was 82; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 8.2 days. Nine of these ($.96\frac{0}{0}$) were returned to duty and 1 transferred to hospital.

Constipatio.—The disease yielded 49 cases, a ratio of $5.23\frac{0}{0}$ against $6.59\frac{0}{0}$ last year. The total number of sick days reached 210; the daily average number sick was $.06\frac{0}{0}$, and the average duration of treatment 4.28 days. Of these 45, or $4.80\frac{0}{0}$, were returned to duty, and 4 transferred to hospital.

Diarrhœa acuta.—This disease represents the largest figures of the class, 396 cases, a ratio of $42.25\frac{0}{0}$ against $49.34\frac{0}{0}$ last year. The number of sick days was 1,466; the daily average number sick $.42\frac{0}{0}$, and the average duration of treatment 3.7 days. Of these 381, or $40.66\frac{0}{0}$, were discharged recovered; 12, or $1.26\frac{0}{0}$, invalided to hospital, and 3 continued.

Diarrhœa chronica.—This gave 16 cases, $1.69\frac{0}{0}$ against $1.47\frac{0}{0}$ the preceding year. The number of sick days was 194; the daily average number sick was $.05\frac{0}{0}$, and the average duration of treatment 12.12 days. Eleven of these, or $1.16\frac{0}{0}$, were sent to duty, and 5, or $.53\frac{0}{0}$, invalided to hospital.

Dysenteria acuta.—The returns give 37 cases, a ratio of $3.94\frac{0}{0}$ against $9.12\frac{0}{0}$ the previous year. The time lost was 289 days; the daily average number sick, $.08\frac{0}{0}$, and the average duration of treatment, 7.56 days. Of these, 33, or $3.52\frac{0}{0}$, were discharged recovered; 3, or $.32\frac{0}{0}$, transferred to hospital, and 1 died.

Dysenteria chronica.—This disease supplied 10 cases, a ratio of $1.06\frac{0}{0}$ against 1.99 the previous year. The number of sick days was 100; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 10 days. Two, or $.21\frac{0}{0}$, recovered; 7 ($.74\frac{0}{0}$) were transferred to hospital.

Gastritis.—Nine cases occurred, a ratio of $.96\frac{0}{0}$ against $1.36\frac{0}{0}$ the

preceding year. The time lost was 57 days; the daily average sick $.01\frac{0}{100}$, and the average duration of treatment 6.33; 8, or $.85\frac{0}{100}$, of these recovered, and 1 was transferred to hospital.

Gastrodynia.—There were 4 cases, $.42\frac{0}{100}$ against $.41\frac{0}{100}$ last year. The sick days were 18, and the average duration of treatment 4.5 days. All recovered on board.

Hæmatemesis.—This malady occurred twice, $.21\frac{0}{100}$ against $.31\frac{0}{100}$ last year. The sick days amounted to 50, and the average duration of treatment 25 days. Both were returned to duty.

Hæmorrhoids.—There were 64 cases encountered, a ratio of $7.66\frac{0}{100}$ against $5.23\frac{0}{100}$ last year. The time lost amounted to 512 days; the daily average number sick $.14\frac{0}{100}$, and the average duration of treatment 8 days. Of these, 54, or $5.75\frac{0}{100}$, were discharged recovered; 8, or $.85\frac{0}{100}$, were transferred to hospital; 1 invalided from the service, and 1 continued.

Hepatitis acuta.—There were 3 cases, a ratio of $.32\frac{0}{100}$ against $.52\frac{0}{100}$ last year. The number of sick days reached 71; the daily average number of sick $.02\frac{0}{100}$, and the average duration of treatment 23.66 days. Of these, 2, or $.21\frac{0}{100}$, recovered on shipboard, and 1 was transferred to hospital.

Hepatitis chronica.—There were only 2 cases of this disease, $.21\frac{0}{100}$. The number of sick days was 32, and the average duration of treatment 16 days. Both were sent to duty.

Hernia.—There were recorded 58 cases, a ratio of $6.17\frac{0}{100}$ against $4.93\frac{0}{100}$ last year. The number of sick days reached 859; the average number daily sick $.25\frac{0}{100}$, and the average number of days under treatment 14.81. Thirty-two, or $3.41\frac{0}{100}$, were returned to duty; 24, or $2.55\frac{0}{100}$, were transferred to hospital, and 2, or $.21\frac{0}{100}$, invalided from service.

Icterus.—There were 18 cases recorded, a ratio of $1.90\frac{0}{100}$ against $1.99\frac{0}{100}$ the previous year. The number of sick days was 233; the average number daily sick $.06\frac{0}{100}$, and the average duration of treatment 12.94 days. Thirteen, or $1.38\frac{0}{100}$, were discharged to duty, and 5, or $.53\frac{0}{100}$, transferred to hospital.

Peritonitis.—There were 3 cases returned, a ratio of $.32\frac{0}{100}$. The time lost was 77 days, and the average duration of treatment 25.66 days. Of these, 2 recovered on board and 1 was transferred to hospital.

Pharyngitis.—There were 81 cases of this disease, a ratio of $8.64\frac{0}{100}$ against $6.39\frac{0}{100}$ last year. The time lost was 342 days; the daily average sick was $.09\frac{0}{100}$, and the average duration of treatment 4.22 days. Of these, 79, or $8.42\frac{0}{100}$, were sent to duty, and 2 continued to next year.

Prolapsus ani.—Of this affection 3 cases occurred, $.32\frac{0}{100}$ against $.31\frac{0}{100}$ the previous year. The number of sick days was 51; the daily average number sick $.01\frac{0}{100}$, and the average duration of treatment 17 days. Of these, 1 recovered on board, and two were transferred to hospital.

Rhagades ani.—There was 1 case returned which recovered and returned to duty.

Stomatitis.—Three cases ($.32\frac{0}{100}$) occurred. The time lost was 13 days, and the average duration of treatment 4.33 days. All recovered.

Tonsillitis.—Of this disease 240 were returned, a ratio of $25.61\frac{0}{100}$ against $23.62\frac{0}{100}$ the previous year. The total number of sick days was 1,068; the daily average number sick $.31\frac{0}{100}$, and the average duration of treatment 4.45 days. Of these, 228, or $24.35\frac{0}{100}$, were discharged to duty; 10, or $1.06\frac{0}{100}$, transferred to hospital, and 2 continued.

Typhlitis.—But 1 case came under notice, which recovered on board after six days' treatment.

Vermes.—Eleven cases, or $1.16\frac{0}{0}$, occurred against 2.19 last year. The time lost was 44 days; the daily average number sick $.01\frac{0}{0}$, and the average duration of treatment 4 days. Of these, 9 recovered on board, and 2 were transferred to hospital.

DISEASES OF THE GENITO-URINARY SYSTEM.

This group of diseases, as found on the returns, is represented by 630 cases, a ratio of $67.12\frac{0}{0}$ against $63.91\frac{0}{0}$ the preceding year. The number of sick days reached 7,513, which gives a daily average number of sick $2.19\frac{0}{0}$, and an average duration of treatment of 11.92 days. There were 527, or $56.23\frac{0}{0}$, returned to duty; 76, or 8.11, transferred to hospital; 4, or $42\frac{0}{0}$, invalided from service; 3, or $32\frac{0}{0}$, died, and 20 were continued to the succeeding year.

In the English navy the admission, invaliding, and death ratios were, respectively, $\frac{0}{0}$; $\frac{0}{0}$; $\frac{0}{0}$. In the German navy, exclusive of venereal diseases, the admission rate was $13.2\frac{0}{0}$, and the average duration of treatment 17.4 days, while the admission rate for venereal diseases was $159.3\frac{0}{0}$, and the average duration of treatment 19.1 days. In the Austrian navy the admission rate was $111.8\frac{0}{0}$.

Albuminuria.—There were 8 cases, a ratio of $.85\frac{0}{0}$ against $.73\frac{0}{0}$ the preceding year. The total number of sick days was 134; the daily average number sick $.03\frac{0}{0}$, and the average duration of treatment 16.75 days. Of these, 2 were returned to duty, 4 were sent to hospital, and 2 died.

Balanitis.—Eight cases occurred in the returns, $.85\frac{0}{0}$ against $.41\frac{0}{0}$ last year. The number of sick days was 85; the daily average number sick $.02\frac{0}{0}$, and the average duration of treatment 10.62 days. Of these, 72, or $.74\frac{0}{0}$, were transferred to hospital, and 1 continued.

Colica nephritica.—There were 3 cases reported ($.32\frac{0}{0}$). The loss of time was 22 days, and the average duration of treatment 7.33 days. All recovered.

Calculus.—Three cases of this disease were encountered, a ratio of $.32\frac{0}{0}$ against $.62\frac{0}{0}$ the preceding year. Two were returned to duty and 1 transferred to hospital.

Chancroides.—There were 115 cases found in the reports, a ratio of $12.20\frac{0}{0}$ against $11.25\frac{0}{0}$ the previous year. The number of sick days was 1,630; the average number daily sick $.47\frac{0}{0}$, and the average duration of treatment 14.17 days. Of these, 98, or $10.44\frac{0}{0}$, were discharged recovered; 9, or $.96\frac{0}{0}$, transferred to hospital; 1 invalided from service, and 7 continued.

Cystitis.—This disease yielded 15 cases, a ratio of $1.59\frac{0}{0}$ against $2.08\frac{0}{0}$ the preceding year. The number of sick days amounted to 239; the daily average number sick $.06\frac{0}{0}$, and the average duration of treatment 15.93 days. Eleven of these, or $1.16\frac{0}{0}$, were discharged recovered; 3, or $.32\frac{0}{0}$, invalided to hospital, and 1 continued.

Dysuria.—Three cases came under observation, a ratio of $.32\frac{0}{0}$ against $1.62\frac{0}{0}$ last year. The number of sick days was 18, and the average duration of treatment 6 days; 2 were discharged to duty, and 1 invalided to hospital.

Enuresis.—Seventeen cases were returned, a ratio of $1.80\frac{0}{0}$ against $1.67\frac{0}{0}$ last year. The loss of time was 52 days; the daily average number sick $.01\frac{0}{0}$, and the average duration of treatment 3.05 days. Of these, 11, or $1.16\frac{0}{0}$, were discharged recovered; 4, or $.42\frac{0}{0}$, were sent to hospital; 1 invalided from service, and 1 continued.

Epididymitis.—There were 6 cases returned, a ratio of $.64\frac{0}{0}$ against $1.04\frac{0}{0}$ last year. The time lost was 41 days; the daily average number

sick $.01\frac{0}{100}$; and the average duration of treatment 6.83 days. All recovered on board.

Gonorrhœa.—Of this affection there are to be found in the returns 218 cases, or $23.26\frac{0}{100}$ against $22.52\frac{0}{100}$ the previous year. The total number of sick days reached 2,627; the daily average number sick $.76\frac{0}{100}$, and the average duration of treatment, 12.05 days. Of these, 198, or $21.17\frac{0}{100}$, were returned to duty; 17, or $1.80\frac{0}{100}$, were transferred to hospital; 1 invalided from the service.

Hæmaturia.—There were 3 cases, $.32\frac{0}{100}$ against $.62\frac{0}{100}$ the previous year. Two were returned to duty, and 1 sent to hospital.

Hydrocele.—There were 5 cases of this disease, $.53\frac{0}{100}$ against $.62\frac{0}{100}$ last year. The loss of time was 61 days; the daily average number of sick $.01\frac{0}{100}$, and the average duration of treatment 12.2 days. Two were returned to duty, and 3 transferred to hospital.

Nephritis.—There are recorded 6 cases, a ratio of $.64\frac{0}{100}$ against $.94\frac{0}{100}$ last year. The number of sick days was 151; the average number daily sick $.04\frac{0}{100}$, and the average duration of treatment 25.16 days. Two, or $.21\frac{0}{100}$, were discharged cured; 3, or $.32\frac{0}{100}$, transferred for hospital treatment, and 1 died.

Orchitis.—The number of this disease reached 159, a ratio of $16.96\frac{0}{100}$ against $14.25\frac{0}{100}$ the preceding year. The number of sick days was 1,756, giving a daily average sick of $.51\frac{0}{100}$, and an average duration of treatment of 11.04 days. There were 139 cases, or $14.83\frac{0}{100}$, discharged to duty; 16, or $1.70\frac{0}{100}$, transferred to hospital, and 4 continued.

Paraphymosis.—There are in the returns 6 cases ($.64\frac{0}{100}$). The number of sick days was 74; the average number daily sick $.02\frac{0}{100}$, and the average duration of treatment 12.33 days. All these cases recovered on board.

Phymosis.—Seven cases were reported, $.74\frac{0}{100}$ against $.94\frac{0}{100}$ last year. The time lost was 81 days; the daily average number sick $.02\frac{0}{100}$, and the average duration of treatment 11.57 days. Five of these cases were discharged recovered; one transferred to hospital, and 1 continued.

Prostatitis.—Six cases came under observation ($.64\frac{0}{100}$). The number of sick days was 81; the average number daily sick $.02\frac{0}{100}$, and the average duration of treatment $13.50\frac{0}{100}$. Four were discharged, recovered; 1 sent to hospital, and 1 continued.

Spermatorrhœa.—There was but 1 case returned, which recovered.

Urethræ strictura.—Of this disease, 28 cases came under treatment, a ratio of $2.97\frac{0}{100}$, against $3.97\frac{0}{100}$ the previous year. The number of sick days reached 295; the daily average number sick $.08\frac{0}{100}$, and the average duration of treatment 10.18 days. Fifteen, or $1.59\frac{0}{100}$, were discharged recovered; 11 were sent to hospital; 1 invalided from service, and 1 continued.

Varicocele.—There were 13 cases, or $1.38\frac{0}{100}$, against $.31\frac{0}{100}$, the previous year. The number of sick days was 147; the average number daily sick $.04\frac{0}{100}$, and the average number of days under treatment 11.30. Eleven, or $1.16\frac{0}{100}$, were discharged to duty; 1 was transferred to hospital, and 1 continued to next year.

DISEASES OF THE LOCOMOTIVE SYSTEM.

Theis disease numbered 42, a ratio of $4.48\frac{1}{100}$ against $5.32\frac{1}{100}$ the preceding year. The number of sick days reached 645; the daily average number sick $.18\frac{0}{100}$, and the average duration of treatment 15.37 days. Thirty-one, or $3.30\frac{0}{100}$, were discharged recovered; 8, or $.85\frac{0}{100}$, were invalided to hospital; 1 invalided from service, and 2 continued.

In the English navy the ratios were, for admissions $\frac{0}{00}$; invaliding $\frac{0}{00}$; death $\frac{0}{00}$. In the German navy the admission rate was $21.1\frac{0}{00}$, and the average duration of treatment 13.1 days.

Arthritis.—Six cases were found in the returns, $.64\frac{0}{00}$ against $.41\frac{0}{00}$ last year. The number of sick days was 130, the daily average number sick $.03\frac{0}{00}$, and the average duration of treatment 21.66 days. All of these cases recovered on shipboard.

Anchylosis.—There were 5 cases, a ratio of $.53\frac{0}{00}$ against $.41\frac{0}{00}$ last year. The number of sick days was 58, the average number daily sick $.01\frac{0}{00}$, and the average duration of treatment 11.6 days. All were sent to duty.

Clavus.—There was 1 case reported, which was returned to duty.

Hydrops articulorum.—Only 1 case came under notice, which was discharged to duty.

Necrosis.—There was 1 case recorded. It was discharged to duty.

Otitis.—There were 3 cases of this affection recorded, $.32\frac{0}{00}$. One of these was discharged recovered, and 2 transferred to hospital.

Periostitis.—Two cases came under treatment ($.21\frac{0}{00}$), which recovered on shipboard.

Synovitis.—Twenty-three cases were returned, a ratio of $2.45\frac{0}{00}$ against $1.88\frac{0}{00}$ last year. The number of sick days reached 308, the average number daily sick $.08\frac{0}{00}$, and the average duration of treatment 13.39 days. Of these, 14, or $1.49\frac{0}{00}$, were returned to duty, 6 were transferred to hospital, 1 invalided from service, and 2 continued.

DISEASES OF THE INTEGUMENTARY SYSTEM.

Cutaneous diseases always form a large contingent of the maladies with which seamen suffer. This class furnishes 976 cases, a ratio of $104.15\frac{0}{00}$ against $101.82\frac{0}{00}$ the preceding year. The number of sick days was 8,678, the daily average number sick $2.53\frac{0}{00}$, and the average duration of treatment 8.89 days. Of the total number, 884 cases, or $90.06\frac{0}{00}$, were sent to duty; 71, or $7.57\frac{0}{00}$, were transferred to hospital; 2, or $.21\frac{0}{00}$, were invalided from service; and 19 continued to the following year.

In the English navy the ratios were, admissions $\frac{0}{00}$, invaliding $\frac{0}{00}$, death $\frac{0}{00}$. In the German navy, admissions $142.0\frac{0}{00}$, and the average duration of treatment 11.6 days. In the Austrian navy, admissions $116.2\frac{0}{00}$, and the average duration of treatment 12.1 days.

Abscessus.—The large number of cases, 241, a ratio of $25.71\frac{0}{00}$ against $28.49\frac{0}{00}$ last year of this disease, is to be noted as a common feature in naval medical returns. The number of sick days was 2,016, the daily average number of sick $.58\frac{0}{00}$, and the average duration of treatment 8.36 days. Of these, 215 were treated successfully on shipboard, 18 required hospital treatment, and 8 were continued to the succeeding year.

Acne.—There were only 2 cases, $.21\frac{0}{00}$ against $.20\frac{0}{00}$ last year. One was sent to duty and the other transferred to hospital.

Anthrax.—This disease numbered 8, a ratio of $.85\frac{0}{00}$ against $.62\frac{0}{00}$ last year. The sick days were 62, the daily average sick $.01\frac{0}{00}$, and the average duration of treatment 7.75 days. Seven of these were sent to duty and 1 transferred to hospital.

Cellulitis.—There were 8 cases, a ratio of $.85\frac{0}{00}$ against $1.57\frac{0}{00}$ last year. The number of sick days reached 82, the average daily sick $.02\frac{0}{00}$, and the average duration of treatment 10.25 days. Seven of these were sent to duty and 1 transferred to hospital.

Ecthyma.—There were 3 cases, a ratio of $.32\frac{0}{00}$ against $.73\frac{0}{00}$ the pre-

vious year. The number of sick days was 30, and the average duration of treatment 10 days. All recovered on board.

Eczema.—There were 24 cases reported, a ratio of $2.55\frac{0}{00}$ against $2.61\frac{0}{00}$ last year. The number of sick days was 174, the daily average number sick $.05\frac{0}{00}$, and the average duration of treatment 7.25 days. Twenty of them recovered on shipboard, 3 were transferred to hospital, and 1 recovered.

Erythema.—There were 6 cases, $.64\frac{0}{00}$ against $.94\frac{0}{00}$ last year. The sick days were 51, the daily average number sick $.01\frac{0}{00}$, and the average duration of treatment 8.50 days. All were sent to duty.

Furunculus.—The largest number of this group falls under this head, 354 cases, a ratio of $37.77\frac{0}{00}$ against $38.02\frac{0}{00}$ the previous year. The number of sick days was 2,068, the daily average sick $.60\frac{0}{00}$, and the average duration of treatment 5.81 days. Three hundred and fifty-one cases, or $37.45\frac{0}{00}$, recovered on board, 1 invalided from the service, and 2 continued.

Herpes.—There were 14 cases, a ratio of $1.48\frac{0}{00}$ against $2.08\frac{0}{00}$ last year. The number of sick days was 164, the daily average number of sick $.04\frac{0}{00}$, and the average duration of treatment 11.71 days; 12 were discharged to duty, and 2 transferred to hospital.

Impetigo.—There was but 1 case, which was returned to duty after a brief treatment.

Lichen.—This disease gave 2 cases ($21\frac{0}{00}$), which speedily recovered.

Onychia.—There were 12 cases of this disease, a ratio of $1.28\frac{0}{00}$ against $1.25\frac{0}{00}$ last year. The number of sick days was 79, the daily average number sick $.02\frac{0}{00}$, and the average duration of treatment 6.58 days. Ten were discharged to duty, 1 to hospital, and 1 continued.

Paronychia.—This disease furnished 87 cases, a ratio of $9.28\frac{0}{00}$ against $6.91\frac{0}{00}$ the previous year. The number of sick days was 906, the daily average number sick $.26\frac{0}{00}$, and the average duration of treatment 10.41 days. Eighty-two, or $8.75\frac{0}{00}$, were sent to duty; 4, or $.42\frac{0}{00}$, transferred to hospital; and 1 continued.

Pemphigus.—Of this malady there were 6 cases, $.64\frac{0}{00}$. The number of sick days 62, the average number daily sick $.01\frac{0}{00}$, and the average duration of treatment 10.33 days. Five were returned to duty, and 1 continued.

Pernio.—There were 11 cases returned, $1.16\frac{0}{00}$ against $.62\frac{0}{00}$ last year. There were 124 sick days, the average number daily sick was $.03\frac{0}{00}$, and the average duration of treatment 11.27 days. All of them recovered.

Prurigo.—There was 1 case of this disease, which required hospital treatment.

Psoriasis.—There were 5 cases, $.53\frac{0}{00}$ against $.83\frac{0}{00}$ last year. The number of sick days reached 107, the average number daily sick was $.03\frac{0}{00}$, and the average duration of treatment 21.4 days. Three recovered on shipboard and 2 were sent to hospital.

Scabies.—This disease contributed 29 cases, a ratio of $3.08\frac{0}{00}$ against $1.47\frac{0}{00}$ last year. The time lost was 129 days the daily average sick $.04\frac{0}{00}$, and the average duration of treatment 4.46 days. Eight cases were treated successfully on shipboard and 21 were sent to hospital.

Tinea.—There were 3 cases ($.32\frac{0}{00}$) against $.41\frac{0}{00}$ last year. The time lost was 31 days, and the average duration of treatment 10.33 days. All recovered on board.

Unguis involutis.—There were 5 cases, a ratio of $.53\frac{0}{00}$ against $7.43\frac{0}{00}$ last year. The time lost was 44 days, the daily average number of sick $.01\frac{0}{00}$, and the average duration of treatment 8.8 days. Four were sent to duty and 1 to hospital.

Ulcus.—There were of this affection 141 cases reported, a ratio of $15.04\frac{0}{0}$ against $3.97\frac{0}{0}$ last year. The time lost was 2,416 days, the daily average number sick $.70\frac{0}{0}$, and the average duration of treatment 17.13 days. One hundred and twenty-one, or $12.91\frac{0}{0}$, were discharged recovered; 15, or $1.59\frac{0}{0}$, transferred to hospital; 1 invalided from service; and 4 continued to next year.

Urticaria.—This disease furnished 7 cases, a ratio of $.74\frac{0}{0}$ against $2.18\frac{0}{0}$ the preceding year. The time lost was 41 days, the daily average number sick $.01\frac{0}{0}$, and the average duration of treatment 5.85 days. All recovered on shipboard.

Verrucda.—There was 1 case, which was returned to duty.

DISEASES OF THE ABSORBENT SYSTEM.

There were returned under this class 173 cases, a ratio of $18.46\frac{0}{0}$ against $18.22\frac{0}{0}$ the previous year. The total number of sick days reached 2,940, the daily average number sick $.85\frac{0}{0}$, and the average duration of treatment 17.03 days. Of this number, 137, or $14.72\frac{0}{0}$, were returned to duty; 30, or $3.20\frac{0}{0}$, were transferred to hospital; and 6 continued to next year.

In the English navy the ratios were as follows: Admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$.

Adenitis.—This disease occurred in 172 cases, a ratio of $18.36\frac{0}{0}$ against $17.91\frac{0}{0}$ last year. The sick days were 2,937, the daily average number of sick $.85\frac{0}{0}$, and the average duration of treatment 17.07 days. Of these cases 136, or $14.51\frac{0}{0}$, were returned to duty; 30, or $3.20\frac{0}{0}$, were sent to hospital, and 6 were continued.

Lymphangitis.—There was a single case occurred, which speedily recovered.

NON-MALIGNANT TUMORS AND CYSTS.

These diseases numbered only 21 cases, a ratio of $2.24\frac{0}{0}$ against $.94\frac{0}{0}$ last year. The number of sick days was 193, the daily average number sick $.05\frac{0}{0}$, and the average duration of treatment 9.19 days; 16, or $1.69\frac{0}{0}$, of these were discharged to duty, 4 were transferred to hospital, and 1 continued.

Adenoma.—There was a single case reported, which was transferred to hospital.

Condyloma.—There were 2 cases of this disease, $.21\frac{0}{0}$. The time lost was 25 days, and the average duration of treatment 12.5 days. Both were discharged cured.

Cystis.—Of this disease there were 8 cases recorded, $.85\frac{0}{0}$. The number of sick days was 98, and the average duration of treatment 12.25 days. All were discharged cured.

Fibroma.—Seven of this disease were noted, $.74\frac{0}{0}$. The number of sick days was 55, and the average duration of treatment 7.85 days. Four were discharged cured, 2 transferred to hospital, and 1 died.

Polypus.—There was a single case returned, which was transferred to hospital.

Sarcoma.—There were 2 cases ($.21\frac{0}{0}$), both of which were discharged cured.

POISONS.

The diseases falling under this heading amounted to 185; a ratio of $19.74\frac{0}{0}$ against $24.30\frac{0}{0}$ last year. The number of sick days was 554, giving a daily average sick rate of $.16\frac{0}{0}$, and an average duration of

treatment of 2.99 days. One hundred and seventy-one, or $17.58\frac{0}{0}$, were returned to duty; 10, or $1.06\frac{0}{0}$, were transferred to hospital, and 4 continued.

In the English navy the ratios were: Admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$.

Alcoholism.—This affection yielded 148 cases, a ratio of $15.78\frac{0}{0}$ against $19.58\frac{0}{0}$ last year. The time lost was 454 days, the daily average number sick $.13\frac{0}{0}$, and the average duration of treatment 3.06 days. One hundred and forty-one, or $15.04\frac{0}{0}$, were returned to duty, 4 transferred to hospital, and 3 continued.

Colica pictonum.—There were 3 cases encountered, $.32\frac{0}{0}$ against $.41\frac{0}{0}$ last year. The time lost was 10 days, and the average duration of treatment was 3.33 days. All recovered on shipboard.

Delirium tremens.—Eleven cases occurred, a ratio of $1.16\frac{0}{0}$ against $1.36\frac{0}{0}$ last year. The number of sick days was 22, and the average duration of treatment 2 days. Four recovered on shipboard, 6 transferred to hospital, and 1 continued.

Ebriositas.—Of this disease there were 17 cases, a ratio of $1.80\frac{0}{0}$ against $1.57\frac{0}{0}$ last year. The number of sick days was 43, and the average duration of treatment 2.52 days. All were treated on shipboard.

Vulnus venenatum.—There were 6 cases recorded, $.64\frac{0}{0}$ against $1.36\frac{0}{0}$ last year. The number of sick days was 25, and the average duration of treatment 4.16 days. All recovered on board.

VIOLENT DISEASES AND DEATHS.

This division includes the most numerous diseases occurring to mariners. The total number reported was 1,591, a ratio of $169.79\frac{0}{0}$ against $176.61\frac{0}{0}$ last year. The total number of sick days was 14,120, the average number daily sick $4.12\frac{0}{0}$, and the average duration of treatment 8.87 days. Of the whole number, 1,450, or $154.73\frac{0}{0}$, were returned to duty; 89, or $9.49\frac{0}{0}$, were transferred to hospital; 2, or $.21\frac{0}{0}$, were invalided from service; 17, or $1.80\frac{0}{0}$, died, and 33 continued to next year.

The ratios of the English navy were: Admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$. In the German navy: Admissions, $130.7\frac{0}{0}$; and the average duration of treatment, 15.9 days. In the Austrian navy: Admissions, $130.4\frac{0}{0}$; and the average duration of treatment, 12.9 days.

Abrasio.—There were 61 cases returned, a ratio of $7.34\frac{0}{0}$ against $9.32\frac{0}{0}$ last year. The time lost was 483 days, yielding a daily average sick rate of $.14\frac{0}{0}$, and an average duration of treatment of 7.90 days. All of these cases were returned to duty.

Ambustio.—The returns show 79 cases ($8.43\frac{0}{0}$) against $7.75\frac{0}{0}$ last year. The total number of sick days reached 698, the average number daily sick days was $.20\frac{0}{0}$, and the average duration of treatment 8.83 days. Seventy-five, or $8.10\frac{0}{0}$, of these were returned to duty, 3 transferred to hospital, and 1 continued.

Concussio cerebri.—The reports show 19 cases, a ratio of $2.01\frac{0}{0}$ against $.73\frac{0}{0}$ last year. The number of sick days was 146, the daily average number sick $.04\frac{0}{0}$, and the average duration of treatment 7.68 days. Eleven of these ($1.16\frac{0}{0}$) were returned to duty ($4.42\frac{0}{0}$), transferred to hospital, and ($4.42\frac{0}{0}$) died.

Concussio spinalis.—There were 3 cases, a ratio of $.32\frac{0}{0}$. The sick days were 66, and the average duration of treatment 22 days. Two were returned to duty and 1 died.

Congelatio.—There were 12 cases returned, a ratio of $1.28 \frac{0}{0}$ against $1.15 \frac{0}{0}$ last year. The number of sick days was 46, the average number daily sick $.01 \frac{0}{0}$, and the average duration of treatment 3.83 days. Ten of these were returned to duty, and 2 invalided to hospital.

Contusio.—This disease supplied 465 cases, a ratio of $49.61 \frac{0}{0}$ against $52.69 \frac{0}{0}$ last year. The number of sick days reached 2,948, the average number daily sick $.86 \frac{0}{0}$, and the average duration of treatment 6.32 days. Of these, 445 were returned to duty, 12 were transferred to hospital, 1 died, and 7 continued.

Fractura.—There were 74 cases returned, a ratio of $7.90 \frac{0}{0}$ against $5.60 \frac{0}{0}$ last year. The total number of sick days 1,719, the average daily number sick $.49 \frac{0}{0}$, and the average duration of treatment 23.09 days. Forty-three, or $4.59 \frac{0}{0}$, were returned to duty, 28, or $2.97 \frac{0}{0}$, were transferred to hospital, 1 died, and 2 continued.

Luxatio.—Of this injury there were 20 cases, a ratio of $2.11 \frac{0}{0}$ against $2.30 \frac{0}{0}$ last year. The number of sick days reached 212, the daily average number sick $.06 \frac{0}{0}$, and the average duration of treatment 10.6 days. Of these cases, 15, or $1.59 \frac{0}{0}$, were discharged to duty, 4, or $.42 \frac{0}{0}$, transferred to hospital, and 1 invalided from service.

Stemma.—There were 336 cases of this injury, a ratio of $35.85 \frac{0}{0}$ against $37.29 \frac{0}{0}$ last year. The number of sick days was 2,694, the daily average number sick $.78 \frac{0}{0}$, and the average duration of treatment 8.03 days. Of these, 304 or $32.44 \frac{0}{0}$, was discharged cured, 18, or $1.90 \frac{0}{0}$, were transferred to hospital, and 14 continued to next year.

Submersio.—There were 5 cases, a ratio of $.53 \frac{0}{0}$ against $.84 \frac{0}{0}$ last year.

Suicidium.—There was one case, same as the preceding year.

Vulnus contusum.—There were 202 cases recorded, a ratio of $21.59 \frac{0}{0}$ against $26.79 \frac{0}{0}$ last year. The number of sick days was 1,896, the daily average number sick $.55 \frac{0}{0}$, and the average duration of treatment 9.38 days. Of this number, 194, or $20.75 \frac{0}{0}$, were returned to duty, 4, or $.42 \frac{0}{0}$, were invalided to hospital, 1 discharged from the service, and 3 continued to next year.

Vulnus incisum.—The records show 128 cases of this injury, or $13.65 \frac{0}{0}$ against $14.45 \frac{0}{0}$ last year. The number of sick days was 1,082, the average number daily sick $.31 \frac{0}{0}$, and the average duration of treatment 8.45 days. One hundred and twenty-one of these were returned to duty, 4 transferred to hospital, 1 died, and 2 continued.

Vulnus laceratum.—There were 123 cases, a ratio of $13.12 \frac{0}{0}$ against $11.20 \frac{0}{0}$ last year. The total number of sick days was 1,609, the daily average number sick $.46 \frac{0}{0}$, and the average duration of treatment 13.08 days. One hundred and ten of these were returned to duty, 7 were invalided to hospital, 2 died, and 4 continued.

Vulnus punctum.—There were 56 cases recorded, a ratio of $5.96 \frac{0}{0}$ against $5.55 \frac{0}{0}$ last year. The number of sick days was 411, the average number daily sick $.11 \frac{0}{0}$, and the average duration of treatment 7.33 days. Fifty-four, or $5.75 \frac{0}{0}$, of these were returned to duty, 1 transferred to hospital, and 1 died.

Vulnus sclopetarium.—There were 7 cases, $.74 \frac{0}{0}$ against $.52 \frac{0}{0}$ last year. The number of sick days reached 111, and the average duration of treatment 15.85 days. Five of these were returned to duty, and 2 transferred to hospital.

Malingering.—The number of feigned diseases, as the preceding year, amounted to 3, a ratio of $.32 \frac{0}{0}$ against $.31 \frac{0}{0}$. They were 2 of rheumatism and 1 of heart disease.

Table showing the number of cases, the discharged to duty, the invalided,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Catarrhus epidemicus.....	3	.32	6
Erysipelas.....	13	1.38	83
Febricula.....	77	8.21	323
Febris cerebro-spinalis.....	1	.10	4
Febris continua simplex.....	102	10.88	846
Febris enterica.....	20	2.13	507
Febris intermittens.....	638	68.08	2,708
Febris remittens.....	138	14.72	1,293
Morbilli.....	7	.74	7
Parotitis.....	4	.42	12
Roseola.....	3	.32	91
Rötheln.....	2	.21	8
Scarlatina.....	5	.53	5
Vaccina.....	114	12.16	876
Varicella.....	1	.10	1
Variola.....	8	.85	90
Varioloides.....	6	.64	10
Total.....	1,142	121.86	6,870
II.—CONSTITUTIONAL DISEASES.			
Adynamia.....	100	10.67	1,156
Anæmia.....	8	.85	65
Carcinoma.....	1	.10	1
Diabetes.....	2	.21	121
Hydrops.....	3	.32	55
Hypertrophia.....	1	.10	21
Lumbago.....	79	8.42	533
Podagra.....	10	1.06	48
Rheumatismus acutus.....	268	28.59	2,836
Rheumatismus chronicus.....	250	26.67	2,581
Rheumatismus gonorrhoeicus.....	3	.32	41
Scrofula.....	3	.32	31
Senectus.....	4	.42	58
Syphilis primitiva.....	194	20.70	3,529
Syphilis consecutiva.....	229	24.43	3,426
Torticollis.....	3	.32	4
Total.....	1,158	123.57	14,506
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Apoplexia.....	3	.32	20
Cephalalgia.....	105	11.20	275
Cerebritis.....	1	.10	1
Chorea.....	2	.21	3
Convulsio.....	5	.53	5
Dementia.....	15	1.59	551
Dysphonia.....	1	.10	4
Epilepsia.....	22	2.34	381
Hysteria.....	7	.74	35
Insolatio.....	9	.96	42
Irritatio spinalis.....	1	.10	1
Insomnia.....	3	.32	7
Mania.....	7	.74	180
Melancholia.....	7	.74	224
Meningitis.....	6	.64	162
Nausea marina.....	73	7.78	224
Neuralgia.....	172	17.68	1,344
Neuritis.....	1	.10	25
Paralysis.....	13	1.38	268
Pleurodynia.....	22	2.34	100
Sciatica.....	3	.32	84
Vertigo.....	27	2.87	181
Total.....	505	53.88	4,117

and the dead, for each disease, with their ratio $\frac{\circ}{\circ}$ of the total force afloat.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Remaining.
Absolute.	% of force.		Number.	% of force.	To hospital.		From serv-ice.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.01	.....	2	2	.21	1	.10	.....	.....	.....	.....	.....
.22	.02	6.38	10	1.06	3	.32	.....	.....	.....	.....	.....
.88	.09	4.19	75	8	2	.21	.....	.....	.....	.....	.....
.01	.....	4	.....	.....	.....	.....	.....	.....	1	.10	.....
2.31	.24	8.29	93	9.91	8	.85	.....	.....	.....	.....	1
1.38	.14	25.35	5	.53	8	.85	.....	.....	4	.42	3
7.41	.79	4.24	593	63.28	39	4.16	1	.10	2	.21	3
3.54	.37	9.36	118	12.59	17	1.81	1	.10	.....	.....	2
.01	.....	1	.....	.....	7	.74	.....	.....	.....	.....	.....
.03	.....	3	2	.21	2	.21	.....	.....	.....	.....	.....
.24	.02	30.33	3	.32	.....	.....	.....	.....	.....	.....	.....
.02	.....	4	1	.10	1	.10	.....	.....	.....	.....	.....
.01	.....	1	.....	.....	5	.53	.....	.....	.....	.....	.....
2.4	.25	7.68	111	11.84	1	.10	.....	.....	.....	.....	2
.....	.....	1	.....	.....	1	.10	.....	.....	.....	.....	.....
.24	.02	11.25	2	.21	6	.64	.....	.....	.....	.....	.....
.02	.....	1.66	.....	.....	6	.64	.....	.....	.....	.....	.....
18.82	2	6.01	1,015	108.31	107	11.41	2	.21	7	.74	11
3.16	.33	11.56	67	7.17	31	3.30	.....	.....	.....	.....	2
.17	.01	8.12	5	.53	3	.32	.....	.....	.....	.....	.....
.....	.....	1	.....	.....	1	.10	.....	.....	.....	.....	.....
.33	.03	60.5	1	.10	.....	.....	.....	.....	.....	.....	1
.15	.01	18.33	3	.32	.....	.....	.....	.....	.....	.....	.....
.05	.....	21	.....	.....	1	.10	.....	.....	.....	.....	.....
1.46	.15	6.74	70	7.47	5	.53	.....	.....	.....	.....	4
.13	.01	4.8	9	.96	1	.10	.....	.....	.....	.....	.....
7.76	.82	10.57	226	24.11	37	3.95	1	.10	.....	.....	4
7.07	.75	10.32	197	21.07	45	4.80	1	.10	.....	.....	7
.11	.01	13.66	1	.10	2	.21	.....	.....	.....	.....	.....
.08	.....	10.33	1	.10	2	.21	.....	.....	.....	.....	.....
.15	.01	14.5	1	.10	2	.21	1	.10	.....	.....	.....
9.66	1.03	18.19	155	16.54	35	3.74	.....	.....	.....	.....	4
9.38	1	14.96	164	17.50	52	5.54	3	.32	.....	.....	10
.01	.....	1.33	3	.32	.....	.....	.....	.....	.....	.....	.....
39.74	4.24	12.52	903	96.36	217	23.15	6	.64	.....	.....	32
.05	.....	6.66	2	.21	.....	.....	.....	.....	1	.10	.....
.75	.08	2.71	103	10.99	2	.21	.....	.....	.....	.....	.....
.....	.....	1	.....	.....	1	.10	.....	.....	.....	.....	.....
.....	.....	1.5	.....	.....	2	.21	.....	.....	.....	.....	.....
.01	.....	1	2	.21	3	.32	.....	.....	.....	.....	.....
1.50	.16	3.67	2	.21	12	1.27	1	.10	.....	.....	.....
.01	.....	4	1	.10	.....	.....	.....	.....	.....	.....	.....
1.04	.11	17.31	9	.96	9	.96	4	.42	.....	.....	.....
.09	.....	5	4	.42	3	.32	.....	.....	.....	.....	.....
.11	.01	4.66	9	.96	.....	.....	.....	.....	.....	.....	.....
.....	.....	1	1	.10	.....	.....	.....	.....	.....	.....	.....
.01	.....	2.33	1	.10	2	.21	.....	.....	.....	.....	.....
.49	.05	25.72	2	.21	5	.53	.....	.....	.....	.....	.....
.61	.06	32	2	.21	5	.53	.....	.....	.....	.....	.....
.44	.04	27	.....	.....	4	.42	.....	.....	2	.21	.....
.61	.06	3.10	73	7.78	.....	.....	.....	.....	.....	.....	.....
3.68	.39	7.81	151	16.14	16	1.69	.....	.....	.....	.....	5
.06	.....	25	1	.10	.....	.....	.....	.....	.....	.....	.....
.73	.07	20.61	7	.74	6	.64	.....	.....	.....	.....	.....
.27	.02	4.54	18	1.71	3	.32	.....	.....	.....	.....	1
.23	.02	28	3	.32	.....	.....	.....	.....	.....	.....	.....
.49	.05	6.70	24	2.56	1	.10	.....	.....	.....	.....	2
11.27	1.20	8.13	415	44.28	74	7.89	5	.53	3	.32	8

Table showing the number of cases, the discharged to duty,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
II.—DISEASES OF THE EYE.			
Amaurosis.....	3	.32	41
Asthenopia.....	3	.32	7
Blepharitis.....	1	.10	2
Conjunctivitis.....	69	8.20	413
Dacrocystitis.....	1	.10	1
Hemeralopia.....	2	.21	2
Hordeolum.....	4	.42	14
Iritis.....	14	1.49	151
Keratitis.....	1	.10	39
Ophthalmia.....	3	.32	7
Ophthalmia gonorrhoeica.....	1	.10	22
Ophthalmia tarsi.....	1	.10	3
Retinitis.....	9	.96	162
Sclerotitis.....	1	.10	51
Ulcus corneæ.....	9	.96	104
Total.....	122	13.01	1,019
III.—DISEASES OF THE EAR.			
Otalgia.....	10	1.06	53
Otitis.....	17	1.80	83
Otorrhœa.....	19	2.01	169
Surditas.....	4	.42	16
Total.....	50	5.33	321
IV.—DISEASES OF THE TEETH.			
Odontalgia.....	15	1.59	39
Parulis.....	2	.21	7
Total.....	17	1.80	46
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Aneurysma.....	8	.85	253
Angina pectoris.....	3	.32	34
Dilatatio cordis.....	1	.10	2
Hypertrophica cordis.....	1	.10	1
Morbi valvularum cordis.....	12	1.28	97
Palpitatio.....	42	4.48	560
Pericarditis.....	1	.10	9
Phlebitis.....	3	.32	15
Syncope.....	2	.21	5
Varix.....	2	.21	19
Total.....	75	8	995
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Asthma.....	26	2.78	253
Bronchitis acuta.....	279	29.76	2,418
Bronchitis chronica.....	68	7.25	1,133
Catarrhus.....	386	41.19	2,191
Epistaxis.....	2	.21	2
Hæmoptysis.....	9	.96	277
Laryngitis.....	27	2.87	204
Phthisis pneumonica acuta.....	6	.64	192
Phthisis pneumonica chronica.....	53	5.65	1,393
Pleuritis.....	35	3.73	637
Pneumonia.....	41	4.38	689
Total.....	932	99.45	9,389

the invalided, and the dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Remaining.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.11	.01	13.66	1	.10	1	.10					1
.01		2.33	1	.10	2	.21					
		2	1	.10							
1.13	.12	5.98	63	7.52	5	.53					1
		1			1	.10					
		1	1	.10	1	.10					
.03		3.5	4	.42							
.41	.04	10.78	12	1.28	2	.21					
.10	.01	39	1	.10							
.01		2.33	1	.10	2	.21					
.06		22	1	.10							
		3			1	.10					
.44	.04	18	3	.32	5	.53					1
.13	.01	51	1	.10							
.28	.02	11.55	4	.42	5	.53					
2.79	.29	8.27	94	10.03	25	2.666					3
.14	.01	5.3	9	.96	1	.10					
.22	.02	4.91	15	1.59	2	.21					
.46	.04	8.89	18	1.90	1	.10					
.04		4	2	.21	2	.21					
.87	.09	6.45	44	4.69	6	.64					
.09		2.6	14	1.48			1	.10			
.01		3.5	2	.21							
.12	.01	2.7	16	1.70			1	.10			
.69	.07	31.62			6	.64			2	.21	
.09		11.33			3	.32					
		2	1	.10							
		1			1	.10					
.26	.02	8.08	3	.32	7	.74	1	.10	1	.10	
1.53	.16	13.33	27	2.88	13	1.38					2
.02		9			1	.10					
.04		5	3	.32							
.01		2.5	2	.21							
.05		9.5	1	.10	1	.10					
2.72	.29	13.26	37	3.94	32	3.41	1	.10	3	.32	2
.69	.07	9.73	18	1.91	5	.53	1	.10			2
6.62	.70	8.66	245	26.14	25	2.68					9
3.10	.33	16.66	35	3.73	28	2.97					5
6	.64	5.67	376	40.13	4	.42	1	.10			5
		1	1	.10	1	.10					
.75	.08	30.77	7	.74	2	.21					
.55	.05	7.55	23	2.45	4	.42					
.52	.05	32	2	.21	4	.42					
3.81	.40	26.28	6	.64	44	4.70	1	.10	1	.10	1
1.74	.18	18.2	26	2.78	9	.96					
1.88	.20	16.80	18	1.90	15	1.59			7	.74	1
25.72	2.74	10.07	757	80.78	141	15.04	3	.32	8	.85	23

Table showing the number of cases, the discharged to duty,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Ascites	1	.10	1
Cholera morbus	52	5.24	131
Colica	141	15.04	424
Congestio hepatis	10	1.06	82
Constipatio	49	5.23	210
Diarrhœa acuta	396	42.25	1,466
Diarrhœa chronica	16	1.69	194
Dysenteria acuta	37	3.94	280
Dysenteria chronica	10	1.06	100
Dyspepsia	54	5.75	702
Enteritis	10	1.06	41
Fistula in ano	10	1.06	53
Gastritis	9	.96	57
Gastrodynia	4	.42	18
Hæmatemesis	2	.21	50
Hæmorrhoids	64	7.66	512
Hepatitis acuta	3	.32	71
Hepatitis chronica	2	.21	32
Hernia	58	6.17	859
Icterus	18	1.90	233
Peritonitis	3	.32	77
Pharyngitis	81	8.64	342
Prolapsus ani	3	.32	51
Rhagades ani	1	.10	14
Stomatitis	3	.32	13
Tonsillitis	240	25.61	1,068
Typhlitis	1	.10	6
Verues	11	1.16	44
Total	1,289	137.55	7,131
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria	8	.85	134
Balanitis	8	.85	85
Colica nephritica	3	.32	22
Calculus	3	.32	5
Chancroides	115	12.20	1,630
Cystitis	15	1.59	239
Dysuria	3	.32	18
Enuresis	17	1.80	52
Epididymitis	6	.64	41
Gonorrhœa	218	23.26	2,627
Hæmaturia	3	.32	5
Hydrocele	5	.53	61
Nephritis	6	.64	151
Orchitis	159	16.96	1,756
Paraphymosis	6	.64	74
Phymosis	7	.74	81
Prostatitis	6	.64	81
Spermatorrhœa	1	.10	9
Urethræ strictura	28	2.97	295
Varicocele	13	1.38	147
Total	630	67.12	7,513
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Arthritis	6	.64	130
Ankylosis	5	.53	58
Clavus	1	.10	3
Hydrops articuloꝝ	1	.10	4
Necrosis	1	.10	3
Ostitis	3	.32	119
Periostitis	2	.21	20
Synovitis	23	2.45	308
Total	42	4.48	645

the invalided, and the dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Remaining.
Absolute.	% of force.		Number.	% of force.	To hospital.		From serv-ice.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
		1			1	.10					
.35	.03	2.23	52	5.24							
1.16	.12	3	139	14.83	1	.10					1
.22	.02	8.2	9	.96	1	.10					
.57	.06	4.28	45	4.80	4	.42					
4	.42	3.7	381	40.66	12	1.26					3
.53	.05	12.12	11	1.16	5	.53					
.76	.08	7.56	33	3.52	3	.32			1	.10	
.27	.02	10	2	.21	7	.74			1	.10	
1.92	.20	13	41	4.38	12	1.26					1
.11	.01	4.1	5	.53	4	.42					1
.14	.01	5.3	3	.32	7	.74					
.15	.01	6.33	8	.85	1	.10					
.04		4.5	4	.42							
.13	.01	25	2	.21							
1.40	.14	8	54	5.75	8	.85	1	.10			1
.19	.02	23.66	2	.21	1	.10					
.08		16	2	.21							
2.35	.25	14.81	32	3.41	24	2.55	2	.21			
.63	.06	12.94	13	1.38	5	.53					
.21	.02	25.66	2	.21	1	.10					
.93	.09	4.22	79	8.42							2
.13	.01	17	1	.10	2	.21					
.03		14	1	.10							
.03		4.33	3	.31							
2.92	.31	4.45	228	24.35	10	1.06					2
.01		6	1	.10							
.12	.01	4	9	.96	2	.21					
19.53	2.08	5.53	1,162	123.99	111	11.84	3	.32	2	.21	11
.36	.03	16.75	2	.21	4	.42			2	.21	
.23	.02	10.62	7	.74							1
.06		7.33	3	.32							
.01		1.66	2	.21	1	.10					
4.46	.47	14.17	98	10.44	9	.96	1	.10			7
.65	.06	15.93	11	1.16	3	.32					1
.04		6	2	.21	1	.10					
.14	.01	3.05	11	1.16	4	.42	1	.10			1
.11	.01	6.83	6	.64							
7.19	.76	12.05	198	21.17	17	1.80	1	.10			2
.01		1.66	2	.21	1	.10					
.16	.01	12.20	2	.21	3	.32					
.41	.04	25.16	2	.21	3	.32			1	.21	
4.81	.51	11.04	139	14.83	16	1.70					4
.20	.02	12.33	6	.64							
.22	.02	11.57	5	.53	1	.10					1
.22	.02	13.5	4	.42	1	.10					1
.02		9	1	.10							
.80	.08	10.18	15	1.59	11	1.16	1	.10			1
.40	.04	11.30	11	1.16	1	.10					1
20.58	2.19	11.92	527	56.23	76	8.11	4	.42	3	.32	20
.35	.03	21.66	6	.64							
.15	.01	11.60	5	.53							
		3	1	.10							
.01		4	1	.10							
		3	1	.10							
.32	.03	39.66	1	.10	2	.21					
.05		10	2	.21							
.84	.08	13.39	14	1.49	6	.64	1	.10			2
1.76	.18	15.37	31	3.30	8	.85	1	.10			2

Table showing the number of cases, the discharged to duty,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus	241	25.71	2,016
Acne.....	2	.21	4
Anthrax.....	8	.85	62
Cellulitis.....	8	.85	82
Ecthyma.....	3	.32	30
Eczema.....	24	2.55	174
Erythema.....	6	.64	51
Furunculus.....	354	37.77	2,068
Herpes.....	14	1.48	164
Impetigo.....	5	.53	57
Intertrigo.....	1	.10	2
Lichen.....	2	.21	9
Onychia.....	12	1.28	79
Paronychia.....	87	9.28	906
Pemphigus.....	6	.64	62
Pernio.....	11	1.16	124
Prurigo.....	1	.10	1
Psoriasis.....	5	.53	107
Scabies.....	29	3.08	129
Tinea.....	3	.32	31
Unguis involutis.....	5	.53	44
Ulcus.....	141	15.04	2,416
Urticaria.....	7	.74	41
Verruca.....	1	.10	19
Total	976	104.15	8,678
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis.....	172	18.36	2,937
Lymphangitis.....	1	.10	3
Total	173	18.46	2,940
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Adenoma.....	1	.10	1
Condyloma.....	2	.21	25
Cystis.....	8	.85	98
Fibroma.....	7	.74	55
Polypus.....	1	.10	7
Sarcoma.....	2	.21	7
Total	21	2.24	193
C.—POISONS.			
Alcoholismus.....	148	15.78	454
Colica pictonum.....	3	.32	10
Delirium tremens.....	11	1.16	22
Erbiositas.....	17	1.80	43
Vulnus venenatum.....	6	.64	25
Total	185	19.74	554
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio.....	61	7.34	483
Ambustio.....	79	8.43	698
Concussio cerebri.....	19	2.01	146
Concussio spinalis.....	3	.32	66
Congelatio.....	12	1.28	46
Contusio.....	465	49.61	2,949
Fractura.....	74	7.90	1,709
Luxatio.....	20	2.11	212
Stremma.....	336	35.85	2,694
Submersio.....	5	.53	5

the invalided, and the dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Remaining.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
5.52	.58	8.36	215	22.94	18	1.90					8
.01		2	1	.10	1	.10					
.16	.01	7.75	7	.74	1	.10					
.22	.02	10.25	7	.74	1	.10					
.08		10	3	.32							
.47	.05	7.25	20	2.13	3	.32					1
.13	.01	8.5	6	.64							
5.66	.60	5.81	351	37.45			1	.10			2
.44	.04	11.71	12	1.28	2	.21					
.15	.01	11.4	4	.42	1	.10					
		2	1	.10							
.02		4.5	2	.21							
.21	.02	6.58	10	1.06	1	.10					1
2.48	.26	10.41	82	8.75	4	.42					1
.16	.01	10.33	5	.53							1
.33	.03	11.27	11	1.16							
		1			1	.10					
.29	.03	21.4	3	.32	2	.21					
.35	.04	4.46	8	.84	21	2.24					
.08		10.33	3	.32							
.12	.01	8.8	4	.42							1
6.61	.70	17.13	121	12.91	15	1.59	1	.10			4
.11	.01	5.85	7	.74							
.05		19	1	.10							
23.77	2.53	8.89	884	90.06	71	7.57	2	.21			19
8.04	.85	17.07	136	14.51	30	3.20					6
		3	1	.21							
8.05	.85	17.03	137	14.72	30	3.20					6
.06		1			1	10					
.26	.02	12.5	2	.21							
.15	.01	12.25	8	.85							
.01		7.85	4	.42	2	.21			1	.10	
.01		7			1	.10					
.01		3.5	2	.21							
.52	.05	9.19	16	1.69	4	.42			1	.10	
1.24	.13	3.06	141	15.04	4	.42					3
.02		3.33	3	.32							
.06		2	4	.42	6	.64					1
.11	.01	2.52	17	1.80							
.06		4.16	6	.64							
1.51	.16	2.99	171	17.58	10	1.06					4
1.32	.14	7.90	61	7.34							
1.91	.20	8.83	75	8.10	3	.32					1
.40	.04	7.68	11	1.16	4	.42			4	.42	
.18	.01	22	2	.21					1	.10	
.12	.01	3.83	10	1.06	2	.21					
8.07	.86	6.32	445	47.48	12	1.28			1	.10	7
4.68	.49	23.09	43	4.59	28	2.97			1	.10	2
.58	.06	10.6	15	1.59	4	.42	1	.10			
7.38	.78	8.03	304	32.44	18	1.90					14
.01		1							5	.53	

Table showing the number of cases, the discharged to duty,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
D.—VIOLENT DISEASES AND DEATHS—Continued.			
Suicidium	1	.10	1
Vulnus contusum.....	202	21.59	1,896
Vulnus incisum.....	128	13.65	1,082
Vulnus laceratum.....	123	13.12	1,609
Vulnus punctum.....	56	5.96	411
Vulnus sclopetarium	7	.74	111
Total	1,591	169.79	14,120
E.—FEIGNED DISEASES.			
Rheumatismus.....	2	.21	15
Hypertrophia cordis.....	1	.10	1
Total	3	.32	16
Grand aggregate.....	8,911	950.91	79,053

the invalided, and the dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Remaining.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
5.19	.55	9.38	194	20.75	4	.42	1	.10	1	.10	3
2.97	.31	8.45	121	12.91	4	.42			1	.10	2
4.40	.46	13.08	110	11.74	7	.74			2	.21	4
1.12	.11	7.33	54	5.75	1	.10			1	.10	
.30	.03	15.85	5	.53	2	.21					
38.68	4.12	8.87	1,450	154.73	89	9.49	2	.21	17	1.80	33
.04		7.5	2	.21							
		1	1	.10							
.04		5.33	3	.32							
216.58	23.11	8.87	7,662	859.83	1,001	106.81	30	3.20	44	4.69	174

INFLUENCE OF AGE UPON MORBIDITY.

The following graphic exhibit presents at a glance the relative percentage of sick in the various classes of disease, and also the influence which is exerted by age upon the movement of sick.

Thus it will be seen that the total amount of sickness is greatest in the class of injuries; next comes the diseases of the digestive system, followed by zymotic and constitutional affections, which stand nearly on the same level, and then the integumentary and respiratory diseases, which present nearly the same percentages. Genito urinary diseases, which stood last year second on the list in order of prevalence, falls to the seventh place in the present exhibit.

As to the prevalence of disease at the various decennial periods, it will be observed that, as last year, it is shown that the zymotic diseases occur most frequently in the earliest and last decenniums, indicating the increased resisting power to these influences in middle life.

The constitutional group shows almost exactly the same progressive increase in the distribution of disease in the various decennial periods as in the report of last year, the rate reaching a higher point in the last decennium than occurs in any other class; a result which follows from the susceptibility to chronic rheumatism and other diseases of old age.

In the nervous class there is a varying liability to disease in the earlier periods and a marked increase in the later ones.

As would naturally be expected, diseases of the eye are shown to be most largely represented in the last decennium, when the visual faculties become permanently impaired. Diseases of the ear, on the contrary, diminish in frequency with the advance in years.

The group of diseases of the circulatory organs indicate a pretty even distribution among the first four periods and a decided increase in the last.

Diseases of the respiratory organs prevailed to a less extent in the second period than in the first, but increased in frequency during the third and fourth, when a small falling off occurred in the fifth.

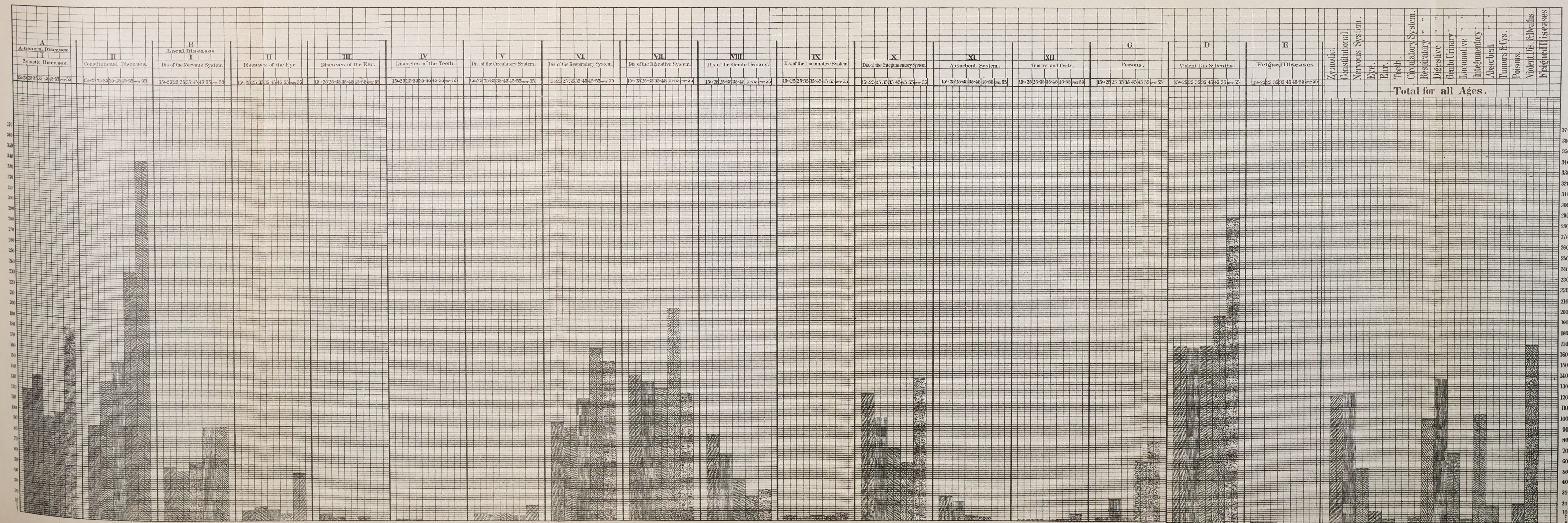
The group of diseases of the digestive system indicates a progressive diminution in the prevalence of these affections, with the exception of the fourth, during which, as was shown last year, a marked increase occurs.

The falling off indicated last year in the frequency of diseases of the genito-urinary diseases, with the advance from youth to the fourth decennium, is again exhibited, as well as the increase which occurs in old age.

Diseases of the locomotive system prevailed to about the same extent during the several decennial periods, though showing a slight tendency to increase with the advance in life.

Integumentary diseases gradually diminish in frequency from the first to the fourth periods, then a sudden and marked increase occurs.

TABLE GRAPHICALLY ILLUSTRATING THE PREVALENCE OF DISEASES AT THE DIFFERENT DECENNIAL PERIODS, AND FOR ALL AGES.



Affections of the absorbent system regularly appeared less frequently from the period of youth to that of old age, by which time the tendency to the diseases of this class seems to have about disappeared.

The class of diseases resulting from poisons is mostly made up from cases contributed by the excessive use of alcoholic drinks, and the table shows the greatest prevalence in the second, fourth, and fifth decennial periods.

Injuries occurred in about the same frequency in the first four periods, and a decided increase in the last.

Table showing the number of cases of disease and injury, the number invalided and

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 4,225.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Catarrhus epidemicus.....	3	.70	1	.23				
Erysipelas.....	3	.70						
Febricula.....	43	10.10	1	.23				
Febris continua simplex.....	47	11.04	4					
Febris enterica.....	10	2.35	4			3	70	
Febris intermittens.....	255	59.92	15	3.52				
Febris remittens.....	50	11.75	7	1.64				
Morbilli.....	5	1.17	5	1.17				
Parotitis.....	3	.70	2	.47				
Roseola.....								
Rötheln.....	2	.47	1	.23				
Scarlatina.....	5	1.17	5	1.17				
Vaccina.....	79	18.56						
Varicella.....	1	.23	1	.23				
Variola.....	3	.70	2	.47				
Varioloides.....	2	.47	2	.47				
Total.....	511	120.09	50	11.75			3	.70
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	26	6.11	4	.94				
Anæmia.....	4	.94	1	.23				
Carcinoma.....								
Hydrops.....								
Hypertrophia.....	1	.23	1	.23				
Lumbago.....	16	3.76						
Podagra.....								
Rheumatismus acutus.....	85	19.97	13	3.05				
Rheumatismus chronicus.....	55	12.92	13	3.05	1	.23		
Rheumatismus gonorrhoeicus.....	1	.23						
Scrofula.....	2	.47	1	.23				
Syphilis primitiva.....	100	23.50	15	3.52				
Syphilis consecutiva.....	90	21.15	18	4.23				
Torticollis.....	1	.23						
Total.....	381	89.54	66	15.51	1	.23		
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia.....								
Cephalalgia.....	57	13.40						
Cerebritis.....	1	.23	1	.23				
Chorea.....	2	.47	2	.47				
Convulsio.....	1	.23						
Dementia.....	3	.70	2	.47	1	.23		
Dysphonia.....								
Epilepsia.....	13	3.05	4	.94	3	.70		
Hysteria.....	2	.47	2	.47				
Insolatio.....	5	1.17						
Insomnia.....								
Mania.....	4	.94	2	.47				
Melancholia.....	1	.23	1	.23				
Meningitis.....	3	.70	1	.23			2	.47
Nausea marina.....	65	15.27						
Neuralgia.....	36	13.15	2	.47				
Neuritis.....								
Paralysis.....	1	.23	1	.23				
Pleurodynia.....	6	1.41	2	.47				
Vertigo.....	2	.47						
Total.....	222	52.17	20	4.70	4	.94	2	.47

dead in decennial periods, with the ratios per thousand of force at those periods.

BETWEEN 25 AND 35 YEARS. (Mean force, 3,213.)								BETWEEN 35 AND 45 YEARS. (Mean force, 1,311.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
7	2.17	1	.31					2	1.52	1	.76				
24	7.46							9	6.86	1	.76				
39	12.13	2	.62					13	9.91	2	1.52				
7	2.17	4	1.24			1	.31	1	.76						
242	75.31	12	3.73			1	.31	86	65.59	8	6.10	1	.76		
66	20.53	7	2.17	1	.31			15	11.44	2	1.52				
2	.62	2	.62												
1	.31														
3	.93														
33	10.26	1	.31					2	1.52						
5	1.55	4	1.24												
4	1.24	4	1.24												
433	134.76	37	11.51	1	.31	2	.62	128	97.63	14	10.67	1	.76		
33	10.26	13	4.04					23	17.54	8	6.10				
1	.31							2	1.52	2	1.52				
3	.93							1	.76	1	.76				
33	10.26	4	1.24					17	12.96						
4	1.24							3	2.28						
87	27.07	11	3.42	1	.31			59	45.00	9	6.86				
73	22.71	14	4.35					54	41.18	6	4.57				
2	.62	2	.62												
1	.31	1	.31												
78	24.27	17	5.29					15	11.44	3	2.28				
110	34.23	28	8.71	3	.93			22	14.97	4	3.05				
1	.31							1	.76						
426	132.58	90	28.01	4	1.24			197	150.25	33	25.94				
23	7.15	1	.31					1	.76						
2	.62	1	.31					17	12.96						
10	3.11	8	2.48					1	.76	1	.76				
8	2.48	4	1.24	1	.31			1	.76	1	.76				
5	1.55	1	.31					1	.76	1	.76				
1	.31							2	1.52						
1	.31	1	.31					1	.76	1	.76				
2	.62	2	.62					1	.76	1	.76				
5	1.55	3	.93												
3	.93	3	.93												
5	1.55							2	1.52						
64	19.92	6	1.86					31	23.65	4	3.05				
1	.31							3	2.28	1	.76				
6	1.86	3	.93					3	2.28						
11	3.42							9	6.86						
9	2.80	1	.31												
156	48.55	34	10.57	1	.31			74	56.44	10	7.62				

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 4,255.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Amaurosis								
Asthenopia	2	.47	1	.23				
Blepharitis	1	.23						
Conjunctivitis	31	7.28	1	.23				
Dacrocystitis								
Hordeolum								
Iritis	5	1.17	1	.23				
Keratitis								
Ophthalmia	2	.47	2	.47				
Ophthalmia gonorrhoeica	1	.23						
Ophthalmia tarsi	1	.23	1	.23				
Retinitis	2	.47						
Sclerotitis								
Ulcus cornæ	3	.70	1	.23				
Total	48	11.28	7	1.64				
III.—DISEASES OF THE EAR.								
Otalgia	8	1.88	1	.23				
Otitis	12	2.82	2	.47				
Otorrhœa	12	2.82						
Surditas	2	.47	1	.23				
Total	34	7.99	4	.94				
IV.—DISEASES OF THE TEETH.								
Odontalgia	10	2.35			1	.23		
Parulis	1	.23						
Total	11	2.58			1	.23		
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma	1	.23	1	.23				
Angina pectoris	2	.47	2	.47				
Morbi valvularum cordis	4	.94	3	.70	1	.23		
Palpitatio	23	5.04	7	1.64				
Pericarditis	1	.23	1	.23				
Phlebitis	2	.47						
Syncope	1	.23						
Varix								
Total	34	7.99	14	3.29	1	.23		
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	5	1.17						
Bronchitis acuta	137	32.20	19	4.46				
Bronchitis chronica	25	5.87	10	2.35				
Catarrhus	158	37.14			1	.23		
Epistaxis	2	.47	1	.23				
Hæmoptysis	4	.94						
Laryngitis	14	3.29	2	.47				
Phthisis pneumonica acuta	2	.47	2	.47				
Phthisis pneumonica chronica	17	3.99	13	3.05				
Pleuritis	17	3.99	3					
Pneumonia	17	3.99	6				2	.43
Total	398	93.53	56	13.15	1	.23	2	.43

in decennial periods, with the rates per thousand of force at those periods—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 3,213.)								BETWEEN 35 AND 45 YEARS. (Mean force, 1,311.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	.31														
1	.31	1	.31												
26	8.09	3	.93					8	6.10						
1	.31	1	.31					1	.76						
3	.93							1	.76						
8	2.48	1	.31												
1	.31														
1	.31														
3	.93	2	.62					4	3.05	3	2.28				
1	.31							2	1.52	2	1.52				
2	.62	1	.31												
48	14.93	9	2.80					16	12.19	5	3.81				
2	.62														
4	1.24														
6	1.86	1	.31												
2	.62	1	.31												
14	4.35	2	.62												
5	1.55														
1	.31														
6	1.86														
1	.31	1	.31					5	3.81	3	2.28			2	1.52
1	.31	1	.31												
6	1.86	3	.93			1	.31	1	.76						
15	4.66	5	1.55					4	3.05	1	.76				
1	.31														
1	.31							1	.76						
25	7.77	10	3.11			1	.31	11	8.38	4	3.05			2	1.52
6	1.86	2	.62					13	9.91	3	2.28	1	.76		
74	23.02	5	1.55					47	35.85	1	.76				
20	6.22	9	2.80					12	9.15	4	3.05				
131	40.77	2	.62					50	38.13	1	.76				
2	.62	1	.31					3	2.28	1	.76				
6	1.86	1	.31					6	4.57						
3	.93	2	.62					1	.76						
25	7.77	21	6.53	1	.31	1	.31	6	4.57	6	4.57				
10	3.11	3	.93					5	3.81	3	2.28				
9	2.80	3	.93					10	7.62	3	2.28			3	2.28
286	89.01	49	15.24	1	.31	1	.31	153	116.69	22	16.78	1	.76	3	2.28

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 4,255.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	14	3.29						
Colica	59	13.86	1	.23				
Congestio hepatis	4	.94	1	.23				
Constipatio	23	5.40						
Diarrhœa acuta	179	42.06	7	1.64				
Diarrhœa chronica	7	1.64	2	.47				
Dysenteria acuta	14	3.29	1	.23				
Dysenteria chronica	3	.70	2	.47				
Dyspepsia	16	3.76	5	1.17				
Enteritis	3	.70	2	.47				
Fistula in ano	3	.70	2	.47				
Gastritis	2	.47						
Gastrodynia								
Hæmatemesis								
Hæmorrhœis	18	4.23	2	.47	1	.23		
Hepatitis acuta	2	.47	1	.23				
Hepatitis chronica								
Hernia	19	4.46	10	2.35	1	.23		
Icterus	7	1.64	5	1.17				
Peritonitis								
Pharyngitis	50	11.75						
Prolapsus ani								
Rhagades ani								
Stomatitis								
Tonsillitis	162		7	1.64				
Typhlitis	1	.23						
Vermes	4	.94	2	.47				
Total	590	138.66	50	11.75	2	.47		
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria	1	.23	1	.23				
Balanitis	6	1.41						
Colica nephritica*								
Calculus								
Chancroides	54	12.69	6	1.41				
Cystitis	8	1.88	3	.70				
Dysuria	2	.47	1	.23				
Enuresis	15	3.52	3	.70	1	.23		
Epididymitis	4	.94						
Gonorrhœa	142	33.37	13	3.05	1	.23		
Hæmaturia	2	.47	1	.23				
Hydrocele	1	.23	1	.23				
Nephritis	2	.47	1	.23				
Orchitis	94	22.09	8	1.88				
Paraphymosis	4	.94						
Phymosis	5	1.17	1	.23				
Prostatitis								
Spermatorrhœa								
Urethræ strictura	6	1.41	3	.70				
Varicocele	4	.94						
Total	350	82.25	42	9.86	2	.47		
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis	4	.94						
Ankylosis	3	.70						
Clavus	1	.23						
Hydrops articulorum	1	.23						
Ostitis	1	.23	1	.23				
Periostitis								
Synovitis	11	2.58	4	.94	1	.23		
Total	21	4.93	5	1.17	1	.23		

in decennial periods, e per thousand of force at those periods—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 3,213.)

BETWEEN 35 AND 45 YEARS. (Mean force, 1,311.)

Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
23	7.15							12	9.15						
49	15.24							21	14.21						
3	.93							2	1.52						
9	2.80							5	3.81						
131	40.77	2	.62					45	34.33	2	1.52				
2	.62							6	4.57	3	2.28				
17	5.29	2	.62					3	2.28						
3	.93	3	.93					2	1.52	1	.76			1	.76
20	6.22	3	.93					13	9.91	2	1.52				
1	.31	1	.31					6	4.57	1	.76				
5	1.55	4	1.24					2	1.52	1	.76				
2	.62							4	3.05	1	.76				
1	.31							1	.76						
1	.31														
28	8.71	5	1.55					14	10.67	1	.76				
1	.31														
2	.62														
23	7.15	9	2.80	1	.31			6	4.57	2	1.52				
9	2.80							2	1.52						
3	.93	1	.31												
22	6.84							5	3.81						
1	.31	1	.31					2	1.52	1	.76				
1	.31														
3	.93														
62	19.29	3	.93					11	8.39						
3	.31							3	2.28						
425	132.26	34	10.57	1	.31			165	126.85	15	11.44			1	.76
3	.93	1	.31					1	.76	1	.76				
1	.31							1	.76						
1	.31							1	.76						
1	.31							1	.76						
43	13.38	2	.62	1	.31			16	12.20	1	.76				
6	1.86														
1	.31														
2	.62							1	.76	1	.76				
63	19.61	4	1.24					11	8.39						
1	.31														
2	.62	1	.31					1	.76	1	.76				
2	.62	1	.31												
53	16.50	5	1.55					8	6.10	2	1.52				
2	.62							2	1.52						
4	1.24							1	.76	1	.76				
1	.31														
12	3.73	4	1.24					7	5.33	3	2.28				
8	2.48	1	.31					1	.76						
206	64.11	19	5.91	1	.31			52	39.65	10	7.62				
2	.62							2	1.52						
1	.31							2	1.52	1	.76				
7	2.17	1	.31					1	.76						
10	3.11	1	.31					2	1.52						
								7	5.33	1	.76				

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 4,255.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	139	32.66	8	1.88				
Acne.....	2	.47	1	.23				
Anthrax.....	1	.23	1	.23				
Cellulitis.....	4	.94						
Ecthyma.....	3	.70						
Eczema.....	3	.70						
Erythema.....	3	.70						
Furunculus.....	182	42.77						
Herpes.....	4	.94	1	.23				
Impetigo.....	4	.94						
Intertrigo.....	1	.23						
Lichen.....	1	.23						
Onychia.....	6	1.41	1	.23				
Paronychia.....	52	12.22	3	.70				
Pemphigus.....	4	.94						
Pernio.....	7	1.64						
Porrigo.....	1	.23	1	.23				
Psoriasis.....	3	.70	1	.23				
Scabies.....	18	4.23	16	3.76				
Tinea.....	2	.47						
Unguis involutis.....	4	.94						
Ulcus.....	71	16.68	7	1.64	1	.23		
Urticaria.....	3	.70						
Verruca.....	1	.23						
Total.....	519	121.97	40	.94	1	.23		
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	97	22.79	11	2.58				
Lymphangitis.....	1	.23						
Total.....	98	23.02	11	2.58				
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Adenoma.....								
Condyloma.....	1	.23						
Cystis.....	4	.94						
Fibroma.....	2	.47	1	.23				
Polypus.....	1	.23	1	.23				
Sarcoma.....	2	.47						
Total.....	10	2.35	2	.47				
C.—POISONS.								
Alcoholismus.....	11	2.58	1	.23				
Colica pictonum.....	1	.23						
Delirium tremens.....	4	.94	3	.70				
Ebriositas.....	2	.47						
Vulnus venenatum.....	2	.47						
Total.....	20	4.70	4	.94				
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....	31	7.28						
Ambustio.....	40	9.40	2	.47				
Concussio cerebri.....	5	1.17	1	.23			1	.23
Concussio spinalis.....	1	.23						
Congelatio.....	8	1.88	1	.23				
Contusio.....	176	41.36	4	.94				
Fractura.....	31	7.28	12	2.82			1	.23
Luxatio.....	8	1.88	2	.47	1	.23		
Stemma.....	142	33.37	8	1.88				
Submersio.....	1	.23					1	.23

in decennial periods, with the rates per thousand of force at those periods—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 3,213.)

BETWEEN 35 AND 45 YEARS. (Mean force, 1,311.)

Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
75	23.33	8	2.48					14	10.67						
4	1.24							2	1.52						
3	.93	1	.31					1	.76						
13	4.04	1	.31					3	2.28						
1	.31														
127	39.52			1	.31			30	22.88						
4	1.24							4	3.05	1	.76				
1	.31							2	1.52						
4	1.24							6	4.57						
29	9.02	1	.31					1	.76						
1	.31							3	2.28						
1	.31														
1	.31	1	.31					1	.76						
11	3.42	5	1.55					1	.76						
43	13.38	7	2.17					23	17.54	1	.76				
3	.93							1	.76						
321	99.28	24	7.46	1	.31			92	70.17	2	1.52				
64	19.91	18	5.60					9	6.86	1	.76				
64	19.91	18	5.60					9	6.86	1	.76				
1	.31							1	.76	1	.76				
3	.93														
3	.93					1	.31	1	.76						
7	2.17					1	.31	2	1.52	1	.76				
55	17.12	1	.31					51	38.89	2	*1.52				
2	.62														
4	1.24	2	.62					2	1.52	1	.76				
4	1.24							7	5.33						
3	.93														
68	21.16	3	.93					60	4.57	3	2.28				
15	4.97							13	9.91						
28	8.71	1	.31					4	3.05						
5	1.55	2	.62					4	3.05	1	.76			2	1.52
2	.62					1	.31								
3	.93							1	.76	1	.76				
171	53.22	5	1.55			1	.31	67	51.10	1	.76				
22	6.84	9	2.80					11	8.39	3	2.28				
6	1.86							4	3.05	1	.76				
111	34.54	5	1.55					58	44.24	3	2.28				
4	1.24					4	1.24								

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 4,255.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
D.—VIOLENT DISEASES AND DEATHS—Continued.								
Vulnus contusum	97	22.80	3	.70	1	.23	.....	.....
Vulnus incisum	71	16.68	1	.23	.....	.....	.....	.....
Vulnus laceratum	60	14.10	2	.47	.....	.....	1	.23
Vulnus punctum	34	7.99	1	.23	.....	.....	1	.23
Vulnus sclopetarium	6	1.41	2	.47	.....	.....	.....	.....
Total	711	167.09	39	9.17	2	.47	5	1.17
E.—FEIGNED DISEASES.								
Rheumatismus	1	.23	.....	.....	.....	.....	.....	.....
Hypertrophia cordis	1	.23	.....	.....	.....	.....	.....	.....
Total	2	.47	.....	.....	.....	.....	.....	.....
Grand aggregate	3,960	930.66	410	96.35	16	3.76	12	2.82

in decennial periods, with the rates per thousand of force at those periods—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 3,213.)								BETWEEN 35 AND 45 YEARS. (Mean force, 1,311.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
69	21.47							24	18.30	1	.76				
38	11.82	3	.93					12	9.15					1	.76
41	12.76	4	1.24			1	.31	17	12.96	1	.76				
17	5.29							4	3.05						
								1	.76						
532	165.57	29	9.02			7	2.17	220	167.81	12	9.15			3	2.28
1	.31														
1	.31														
3,028	942.42	359	111.73	10	3.11	12	3.73	1,186	904.65	133	101.45	2	1.52	9	6.86

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 460.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Catarrhus epidemicus.....								
Erysipelas.....								
Febricula.....								
Febris cerebro-spinalis.....	1	2.17					1	2.17
Febris continua simplex.....	3	6.52						
Febris enterica.....	2	4.34						
Febris intermittens.....	36	78.26	4	8.69			1	2.17
Febris remittens.....	4	8.69	1	2.17				
Morbilli.....								
Parotitis.....								
Roseola.....								
Rötheln.....								
Scarlatina.....								
Vaccina.....								
Varicella.....								
Variola.....								
Varioloides.....								
Total.....	46	99.99	5	10.86			2	4.34
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	14	30.42	3	6.52				
Anæmia.....	1	2.17						
Carcinoma.....								
Diabetes.....	2	4.34						
Hydrops.....								
Hypertrophia.....								
Lumbago.....	7	15.21						
Podagra.....	3	6.52	1	2.17				
Rheumatismus acutus.....	33	71.73	4	8.69				
Rheumatismus chronicus.....	44	95.65	9	19.56				
Rheumatismus gonorrhoeicus.....								
Scrofula.....								
Senectus.....	1	2.17						
Syphilis primitiva.....	1	2.17						
Syphilis consecutiva.....	3	6.52	2	4.34				
Torticollis.....								
Total.....	109	236.95	19	41.29				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia.....	1	2.17						
Cephalalgia.....	5	10.86						
Cerebritis.....								
Chorea.....								
Convulsio.....	1	2.17	1	2.17				
Dementia.....	1	2.17	1	2.17				
Dysphonia.....								
Epilepsia.....								
Hysteria.....								
Insolatio.....								
Irritatio spinalis.....	1	2.17						
Insomnia.....								
Mania.....								
Melancholia.....	1	2.17	1	2.17				
Meningitis.....								
Nausea marina.....	1	2.17						
Neuralgia.....	18	39.12	3	6.52				
Neuritis.....								
Paralysis.....	3	6.52	1	2.17				
Pleurodynia.....	2	4.34	1	2.17				
Sciatica.....	3	6.52						
Vertigo.....	4	8.69						
Total.....	41	89.13	8	17.39				

in decennial periods, with the ratios per thousand of force at those periods—Continued.

ABOVE 55 YEARS. (Mean force, 132.)								TOTALS. (Mean force, 9,371.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	7.57	1	7.57					3	.32	1	.10				
1	7.57							13	1.38	3	.32				
								77	8.21	2	.21				
								1	.10					1	.10
								102	10.88	8	.85				
								20	2.13	8	.85			4	.42
19	143.93							638	68.08	39	4.16	1	.10	2	.21
3	22.72							138	14.72	17	1.81	1	.10		
								7	.74	7	.74				
								4	.42	2	.21				
								3	.32						
								2	.21	1	.10				
								5	.53	5	.53				
								114	12.16	1	.10				
								1	.10	1	.10				
								8	.85	6	.64				
								6	.64	6	.64				
24	181.81	1	7.57					1,142	121.86	107	11.41	2	.21	7	.74
4	30.30	3	22.72					100	10.67	31	3.30				
								8	.85	3	.32				
								1	.10	1	.10				
								2	.21						
								3	.32						
								1	.10	1	.10				
6	45.45	1	7.57					79	8.42	5	.53				
								10	1.06	1	.10				
4	30.30							268	28.59	37	3.95	1	.10		
24	181.81	3	22.72					250	26.67	45	4.80	1	.10		
								3	.32	2	.21				
								3	.32	2	.21				
3	22.72	2	15.15	1	7.57			4	.42	2	.21	1	.10		
								194	20.70	35	3.74				
4	30.30							229	24.43	52	5.54	3	.32		
								3	.32						
45	340.90	9	68.18	1	7.57			1,158	123.57	217	23.15	6	.64		
1	7.57					1	7.57	3	.32					1	.10
3	22.72	1	7.57					105	11.20	2	.21				
								1	.10	1	.10				
								2	.21	2	.21				
								5	.53	3	.32				
								15	1.59	12	1.27	1	.10		
								1	.10						
								22	2.34	9	.96	4	.42		
								7	.74	3	.32				
1	7.57							9	.96						
								1	.10						
1	7.57							3	.32	2	.21				
								7	.74	5	.53				
								7	.74	5	.53				
								6	.64	4	.42			2	.21
								73	7.78						
3	22.72	1	7.57					172	17.68	16	1.69				
								1	.10						
								13	1.38	6	.64				
								22	2.34	3	.32				
								3	.32						
3	22.72							27	2.87	1	.10				
12	90.91	2	15.15			1	7.57	505	53.88	74	7.89	5	.53	3	.32

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 460.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio $\frac{\text{‰}}{\text{‰}}$.	To hospital.		From serv- ice.		Number.	Ratio $\frac{\text{‰}}{\text{‰}}$.
			No.	Ratio $\frac{\text{‰}}{\text{‰}}$.	No.	Ratio $\frac{\text{‰}}{\text{‰}}$.		
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Amaurosis								
Asthenopia								
Blepharitis								
Conjunctivitis	2	4.34						
Dacrocystitis								
Hemeralopia								
Hordeolum								
Iritis								
Keratitis								
Ophthalmia								
Ophthalmia gonorrhoeica								
Ophthalmia tarsi								
Retinitis								
Sclerotitis								
Ulcus cornæ	2	4.34	1	2.17				
Total	4	8.69	1	2.17				
III.—DISEASES OF THE EAR.								
Otalgia								
Otitis	1	2.17						
Otorrhœa	1	2.17						
Surditas								
Total	2	4.34						
IV.—DISEASES OF THE TEETH.								
Odontalgia								
Parulis								
Total								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma	1	2.17	1	2.17				
Angina pectoris								
Dilatatio cordis	1	2.17						
Hypertrophica cordis								
Morbi valvularum cordis								
Palpitatio								
Pericarditis								
Phlebitis								
Syncope								
Varix	1	2.17	1	2.17				
Total	3	6.52	2	4.34				
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma								
Bronchitis acuta	18	39.12						
Bronchitis chronica	9	19.56	3	6.52				
Catarrhus	41	89.13	1	2.17				
Epistaxis								
Hæmoptysis								
Laryngitis	1	2.17	1	2.17				
Phthisis pneumonica acuta								
Phthisis pneumonica chronica	2	4.34	2	4.34				
Pleuritis	1	2.17						
Pneumonia	3	6.52	2	4.34			1	2.17
Total	75	163.05	9	19.56			1	2.17

in decennial periods, with the rates per thousand of force at those periods—Continued.

ABOVE 55 YEARS. (Mean force, 132.)								TOTALS. (Mean force, 9,371.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
2	15.15	1	7.57					3	.32	1	.10				
								3	.32	2	.21				
								1	.10						
2	15.15	1	7.57					69	8.20	5	.53				
								1	.10	1	.10				
2	15.15	1	7.57					2	.21	1	.10				
								4	.42						
								14	1.49	2	.21				
								1	.10						
								3	.32	2	.21				
								1	.10						
								1	.10	1	.10				
								9	.96	5	.53				
								1	.10						
								9	.96	5	.53				
6	45.45	3	22.72					122	13.01	25	2.66				
								10	1.06	1	.10				
								17	1.80	2	.21				
								19	2.01	1	.10				
								4	.42	2	.21				
								50	5.33	6	.64				
								15	1.59			1	.10		
								2	.21						
								17	1.80			1	.10		
								8	.85	6	.64			2	.21
								3	.32	3	.32				
								1	.10						
1	7.57	1	7.57					1	.10	1	.10				
1	7.57	1	7.57					12	1.28	7	.74	1	.10	1	.10
								42	4.84	13	1.38				
								1	.10	1	.10				
								3	.32						
								2	.21						
								2	.21	1	.10				
2	15.15	2	15.15					75	8.	32	3.41	1	.10	3	.33
2	15.15							26	2.78	5	.53	1	.10		
3	22.72							279	29.76	25	2.68				
2	15.15	2	15.15					68	7.25	28	2.97				
6	45.45							386	41.19	4	.42	1	.10		
								2	.21	1	.10				
								9	.96	2	.21				
								27	2.87	4	.42				
								6	.64	4	.42				
3	22.72	2	15.15					53	5.65	44	4.70	1	.10	1	.10
2	15.15							35	3.73	9	.96				
2	15.15	1	7.57			1	7.57	41	4.38	15	1.59			7	.74
20	151.51	5	37.87			1	7.57	932	99.45	141	15.04	3	.32	8	.85

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 460.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Ascites.....	1	2.17	1	2.17				
Cholera morbus.....	2	4.34						
Colica.....	12	26.08						
Congestio hepatis.....								
Constipatio.....	12	26.08	4	8.69				
Diarrhœa acuta.....	32	69.56	1	2.17				
Diarrhœa chronica.....								
Dysenteria acuta.....	3	6.52					1	2.17
Dysenteria chronica.....								
Dyspepsia.....	5	10.86	2	4.34				
Enteritis.....								
Fistula in ano.....								
Gastritis.....								
Gastrodynia.....	2	4.34						
Hæmatemesis.....	1	2.17						
Hæmorrhœis.....	4	8.69						
Hepatitis acuta.....								
Hepatitis chronica.....								
Hernia.....	10	21.71	3	6.52				
Icterus.....								
Peritonitis.....								
Pharyngitis.....	4	8.69						
Prolapsus ani.....								
Rhagades ani.....								
Stomatitis.....								
Tonsillitis.....	4	8.69						
Typhlitis.....								
Vermes.....	1	* 2.17						
Total.....	93	202.17	11	23.91			1	2.17
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria.....	1	2.17					1	2.17
Balanitis.....								
Colica nephritica.....	1	2.17						
Calculus.....								
Chancroides.....	1	2.17						
Cystitis.....								
Dysuria.....								
Enuresis.....	1	2.17						
Epididymitis.....								
Gonorrhœa.....	2	4.34						
Hæmaturia.....								
Hydrocele.....								
Nephritis.....	1	2.17					1	2.17
Orchitis.....								
Paraphymosis.....								
Phymosis.....								
Prostatitis.....	1	2.17						
Spermatorrhœa.....								
Urethræ strictura.....	3	6.52	1	2.17	1	2.17		
Varicocele.....								
Total.....	11	23.91	1	2.17	1	2.17	2	4.34
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis.....								
Ankylosis.....								
Clavus.....								
Hydrops articulo- rum.....								
Necrosis.....	1	2.17						
Ostitis.....								
Periostitis.....								
Synovitis.....	2	4.34						
Total.....	3	6.52						

in decennial periods, with the rates per thousand of force at those periods—Continued.

ABOVE 55 YEARS. (Mean force, 132.)								TOTALS. (Mean force, 9,371.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	7.57							1	.10	1	.10				
1	7.57							52	5.24						
1	7.57							141	15.04	1	.10				
9	68.18							10	1.06	1	.10				
1	7.57							49	5.23	4	.42				
2	15.15	1	7.57					396	42.25	12	1.26				
								16	1.69	5	.53				
								37	3.94	3	.32			1	.10
								10	1.06	7	.74			1	.10
								54	5.75	12	1.26				
								10	1.06	4	.42				
								10	1.06	7	.74				
1	7.57							9	.96	1	.10				
								4	.42						
								2	.21						
								64	7.66	8	.85	1	.10		
								3	.32	1	.10				
								2	.21						
								58	6.17	24	2.55	2	.21		
								18	1.90	5	.53				
								3	.32	1	.10				
								81	8.64						
								3	.32	2	.21				
								1	.10						
								3	.32						
1	7.57							240	25.61	10	1.06				
								1	.10						
								11	1.16	2	.21				
16	121.22	1	7.57					1,228	137.55	111	11.84	3	.32	2	.21
2	15.15	1	7.57			1	7.57	8	.85	4	.42			2	.21
1	7.57	1	7.57					8	.85						
1	7.57							3	.32						
1	7.57							3	.32	1	.10				
								115	12.20	9	.96	1	.10		
								15	1.59	3	.32				
								3	.32	1	.10				
								17	1.80	4	.42	1	.10		
								6	.64						
								218	23.26	17	1.80	1	.10		
								3	.32	1	.10				
1	7.57							5	.53	3	.32				
1	7.57	1	7.57					6	.64	3	.32			1	.10
4	30.30	1	7.57					159	16.96	16	1.70				
								6	.64						
								7	.74	1	.10				
								6	.64	1	.10				
								1	.10						
								28	2.97	11	1.16	1	.10		
								13	1.38	1	.10				
11	83.34	4	30.30			1	7.57	630	67.12	76	8.11	4	.42	3	.32
								6	.64						
								5	.53						
								1	.10						
								1	.10						
								1	.10						
								3	.32	2	.21				
								2	.21						
1	7.57	1	7.57					23	2.45	6	.64	1	.10		
1	7.57	1	7.57					42	4.48	8	.85	1	.10		

Table showing the number of cases of disease and injury, the number invalided and dead

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 460.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	9	19.56	1	2.17				
Acne.....								
Anthrax.....	1	2.17						
Cellulitis.....								
Ecthyma.....								
Eczema.....	2	4.34	1	2.17				
Erythema.....	2	2.17						
Furunculus.....	7	15.21						
Herpes.....	2	4.34						
Impetigo.....	1	2.17	1	2.17				
Intertrigo.....								
Lichen.....								
Onychia.....								
Paronychia.....								
Pemphigus.....								
Pernio.....								
Porrigio.....								
Psoriasis.....								
Scabies.....								
Tinea.....								
Unguis involutis.....	1	2.17						
Ulcus.....	2	4.34						
Urticaria.....								
Verruca.....								
Total.....	26	56.51	3	6.52				
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	2	4.34						
Lymphangitis.....								
Total.....	2	4.34						
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Adenoma.....								
Condyloma.....								
Cystis.....	1	2.17						
Fibroma.....								
Polypus.....								
Sarcoma.....								
Total.....	1	2.17						
C.—POISONS.								
Alcoholismus.....	22	47.82						
Colica pictonum.....								
Delirium tremens.....	1	2.17						
Ebriositas.....	3	6.52						
Vulnus venenatum.....	1	2.17						
Total.....	27	58.69						
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....	1	2.17						
Ambustio.....	5	10.86						
Concussio cerebri.....	3	6.52						
Concussio spinalis.....								
Congelatio.....								
Contusio.....	39	84.78						
Fractura.....	7	15.21	3	6.52				
Luxatio.....	2	4.34	1	2.17				
Stremma.....	17	36.95						
Submersio.....								

in decennial periods, with the rates per thousand of force at those periods—Continued.

ABOVE 55 YEARS. (Mean force, 132.)								TOTALS. (Mean force, 9,371.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
4	30.30	1	7.57					241	25.71	18	1.90				
								2	.21	1	.10				
								8	.85	1	.10				
								8	.85	1	.10				
								3	.32						
3	22.72	1	7.57					24	2.55	3	.32				
1	7.57							6	.64						
8	60.60							354	37.77			1	.10		
								14	1.48	2	.21				
								5	.53	1	.10				
								1	.10						
								2	.21						
								12	1.28	1	.10				
								87	9.28	4	.42				
								6	.64						
								11	1.16						
								1	.10	1	.10				
								5	.53	2	.21				
								29	3.08	21	2.24				
								3	.32						
								5	.53						
2	15.15							141	15.04	15	1.59	1	.10		
								7	.74						
								1	.10						
18	136.37	2	15.15					976	104.15	71	7.57	2	.21		
								172	18.36	30	3.20				
								1	.10						
								173	18.46	30	3.20				
								1	.10	1	.10				
								2	.21						
								8	.85						
1	7.57	1	7.57					7	.74	2	.21			1	.10
								1	.10	1	.10				
								2	.21						
1	7.57	1	7.57					21	2.24	4	.42			1	.10
9	68.18							148	15.78	4	.42				
								3	.32						
1	7.57							11	1.16	6	.64				
								17	1.80						
								6	.64						
10	75.75							185	19.74	10	1.06				
1	7.57							61	7.34						
2	15.15							79	8.43	3	.32				
2	15.15					1	7.57	19	2.01	4	.42			4	.42
								3	.32					1	.10
								12	1.28	2	.21				
12	90.91	2	15.15					465	49.61	12	1.28			1	.10
3	22.72	1	7.57					74	7.90	28	2.97			1	.10
								20	2.11	4	.42	1	.10		
8	60.60	2	15.15					336	35.85	18	1.90				
								5	.53					5	.53

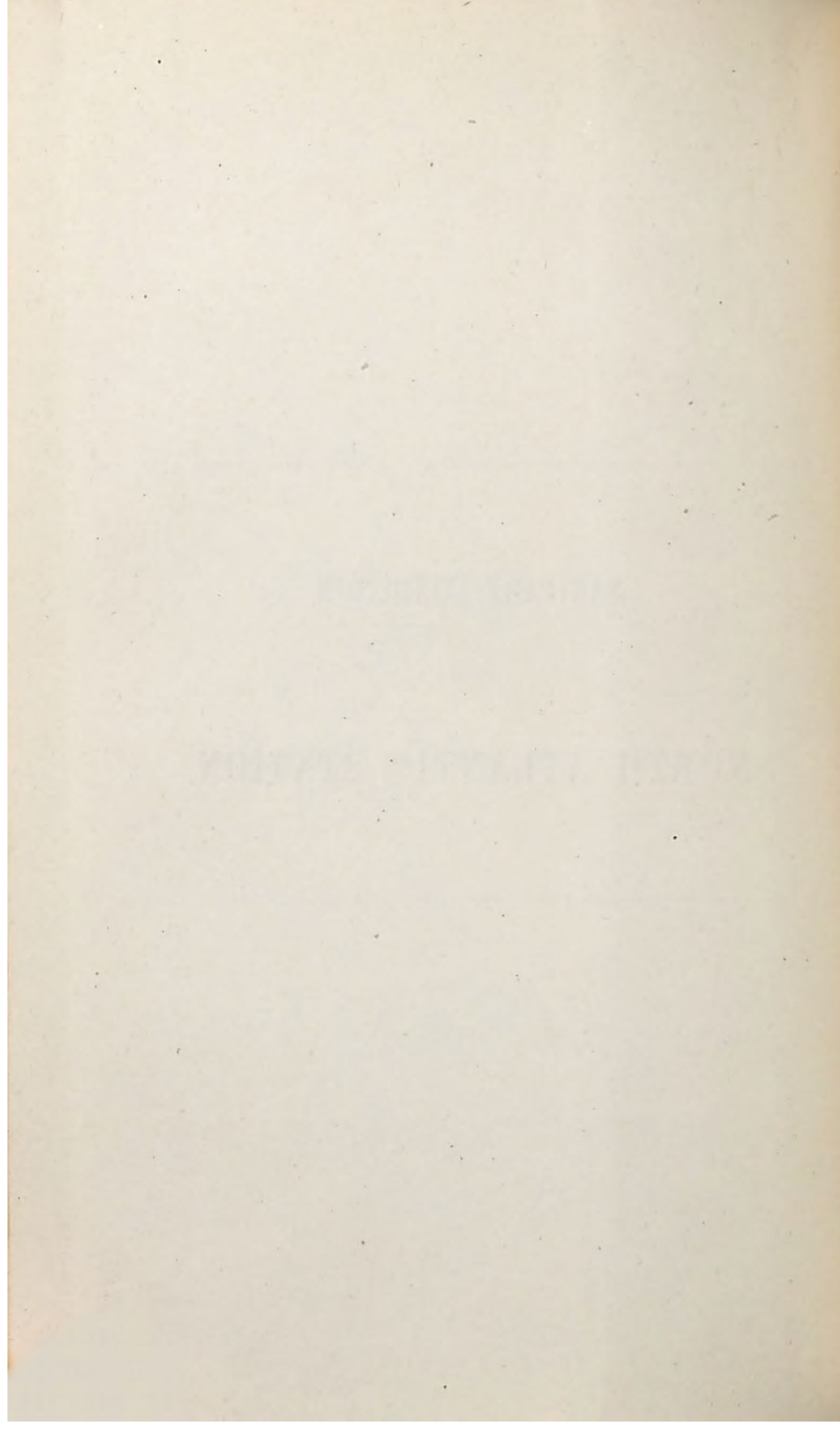
Table showing the number of cases of disease and injury, the number invalided and dead

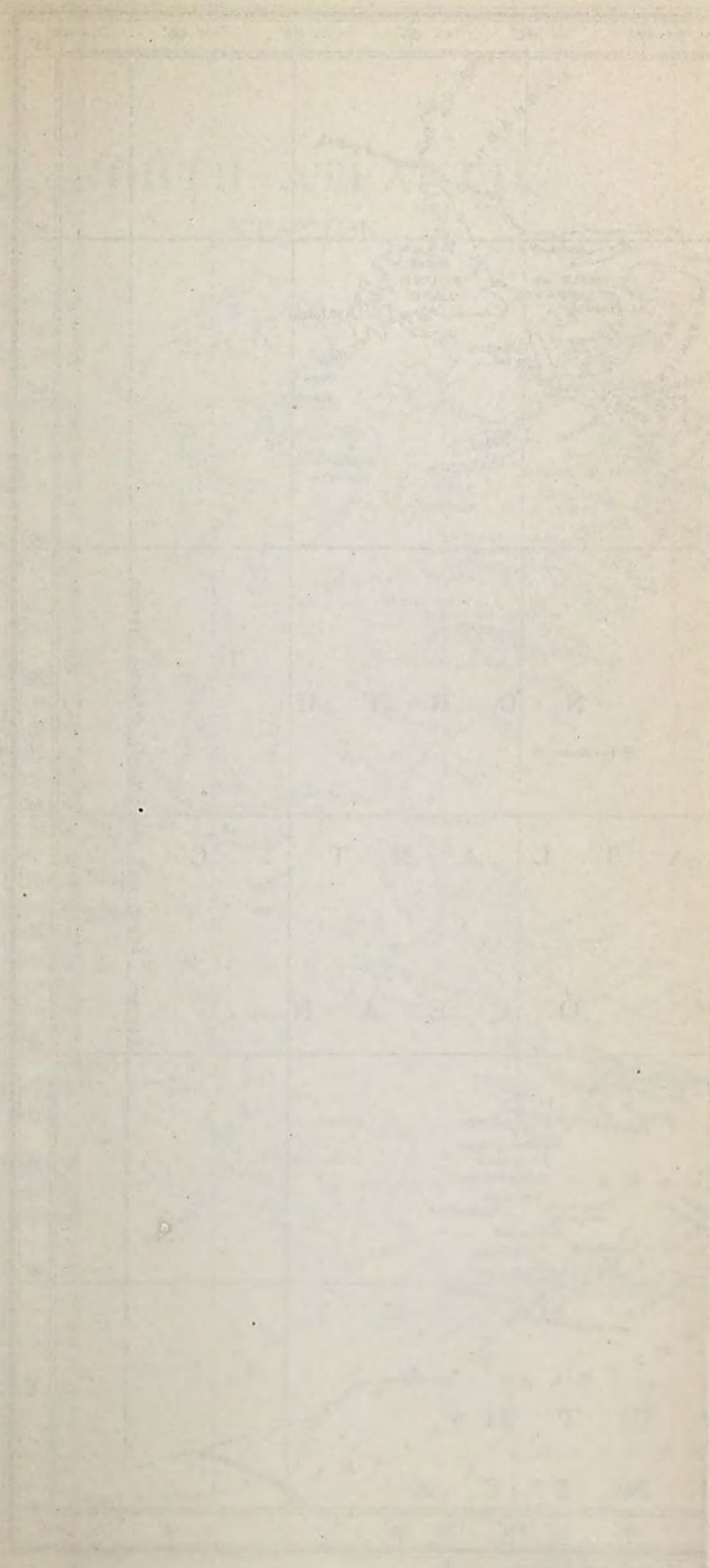
Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 4,460.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
D.—VIOLENT DISEASES AND DEATHS—Continued.								
Suicidium	1	2.17					1	2.17
Vulnus contusum	7	15.21						
Vulnus incisum	4	8.69						
Vulnus laceratum	4	8.69						
Vulnus punctum								
Vulnus sclopetarium								
Total.....	90	195.65	4	8.69			1	2.17
E.—FEIGNED DISEASES.								
Rheumatismus								
Hypertrophia cordis								
Total.....								
Grand aggregate	533	1,158.69	63	136.96	1	2.17	7	15.21

in decennial periods, with the rates per thousand of force at those periods—Continued.

ABOVE 55 YEARS. (Mean force, 3,132.)								TOTALS. (Mean force, 9,371.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
5	37.87							1	.10					1	.10
3	22.72							202	21.59	4	.42	1	.10		
1	7.57							128	13.65	4	.42			1	.10
1	7.57							123	13.12	7	.74			2	.21
								56	5.96	1	.10			1	.10
								7	.74	2	.21				
38	287.88	5	37.87			1	7.57	1,591	169.79	89	9.49	2	.21	17	1.80
								2	.21						
								1	.10						
								3	.32						
204	1,545.45	36	272.73	1	7.57	4	30.30	8,911	950.91	1,001	106.81	30	3.20	44	4.69

SANITARY CONDITION
OF THE
NORTH ATLANTIC STATION.







NORTH ATLANTIC STATION.

The North Atlantic station includes the eastern coast of North America, the shores of the Gulf of Mexico, Central America, and the coast of South America as far as 5° of north latitude, and the West India Islands.

The squadron employed on this station in 1882 comprised 37 vessels, viz, 5 first-rates, 4 second-rates, 11 third-rates, and 17 fourth-rates, of which 2 were Coast-Survey vessels and 8 iron-clads in ordinary. The strength was 5,326 men, and corrected for time, 4,714 men, a diminution of 286.

The total number of admissions, including those remaining from

the previous year, was	4,211	=	893.29 $\frac{0}{0}$
Discharged recovered	3,467	=	735.46 $\frac{0}{0}$
Invalided $\left\{ \begin{array}{l} \text{to hospital} \\ \text{from service} \end{array} \right.$	642	=	136.1 $\frac{0}{0}$
Died	16	=	3.39 $\frac{0}{0}$
Continued to following year	19	=	4.03 $\frac{0}{0}$
	67		

The loss of time amounted to 31,372 days; the daily average number of sick was 85.95, and per thousand of strength 18.23. The average duration of treatment was 7.45 days.

It will be observed that while there was a diminution of 767, or 18.51 $\frac{0}{0}$, in the number of cases admitted, as compared with the preceding year, there was an increase of 644 in the number of sick days, indicating a greater average duration of treatment. The decrease of the number invalided to hospital amounted to 7, a difference in the ratio of 5.9 $\frac{0}{0}$, while there was an increase of 79 $\frac{0}{0}$ in the number invalided from the service. The number of deaths was increased by 3, or 1.43 $\frac{0}{0}$.

The improved sanitary condition referred to in the report of last year is thus seen to be progressive.

The sick rate reported from the British squadron for this year was ———, the invaliding rate ———, the death rate ———, and the average daily number of sick was ———.

In the German squadron the admission ratio was 1,207.5 $\frac{0}{0}$, the daily average number sick 32.11 $\frac{0}{0}$, and the average duration of treatment 13.9 days.

The daily average sick rate per thousand of the several vessels, arranged in numerical order, is shown in the following table, and compared with those of the three preceding years:

Ships.	1879.	1880.	1881.	1882.
Mayflower	15.07	.....	14.11	111.81
Constellation	13.55	23.90	7.61	106.71
Dale .....	.....	17.65	1.47	73.17
Manhattan	5.62	1.25	1.42	34.61
Standish	4.52	.....	20.00	33200
Michigan	18.20	22.60	0.22	30.76
Miantonomoh .....	.....	.....	.....	30.60
Alliance .....	.....	29.57	0.84	28.08
Enterprise .....	.....	.....	.....	27.54
New Hampshire	18.03	15.27	2.15	27.47
Kearsarge	15.88	24.51	1.24	27.25
Tallapoosa	12.96	16.80	5.55	26.77
Portsmouth	24.58	22.39	4.38	22.75

Ships.	1879.	1880.	1881.	1882.
Passaic	3.50	3.75	2.40	21.69
Jamestown				21.17
Nantucket				19.23
Gedney	13.26	12.17	6.11	18.96
Tennessee	25.43	15.14	0.75	17.04
Despatch		12.57	3.00	16.91
Saratoga		17.65	1.47	16.53
Powhatan	34.70	21.78	1.30	15.77
Wyoming				14.36
Lehigh	37.50	13.75	1.66	14.28
Franklin	15.45	6.75	2.63	14.10
Minnesota	24.33	34.53	2.46	13.50
Vandalia	21.34	16.00	0.83	13.38
St. Louis	20.90	15.74	4.45	12.62
Mahopac	6.87	3.75		12.50
Yantic		10.15	1.31	12.19
Catskill	24.70	8.23	0.58	10.66
Ajax	20.74	7.33	0.31	10.00
Wabash	10.49	7.42	1.09	9.49
Bache	7.85	41.46	5.38	9.6
Colorado	7.49	6.51	0.62	7.31
Montauk	0.17	2.50	2.40	6.97
Alarm	21.00	18.80	12.70	6.00
Wyandotte	4.70		2.22	3.23

The daily average loss of service per thousand was apportioned among the various classes of disease as shown in the following table, comparing the numbers with the three preceding years:

Diseases.	1879.	1880.	1881.	1882.
GENERAL DISEASES:				
Zymotic	2.57	1.51	2.03	1.98
Constitutional	2.59	3.25	2.30	2.77
LOCAL DISEASES:				
Diseases of the nervous system	.54	.72	.44	.72
Diseases of the eye	.13	.44	.19	.30
Diseases of the ear	.09	.08	.08	.14
Diseases of the teeth		.01	.01	.01
Diseases of the circulatory system	.05	.28	.12	.14
Diseases of the respiratory system	2.10	2.59	1.76	1.87
Diseases of the digestive system	2.09	3.01	1.97	1.70
Diseases of the genito-urinary system	1.92	1.44	1.29	1.51
Diseases of the locomotive system	.13	.12	.29	.18
Diseases of the integumentary system	1.90	2.15	2.34	2.60
Diseases of the absorbent system		.28	.45	.50
Non-malignant tumors and cysts	.15	.02		.04
POISONS	.15	.14	.12	.13
VIOLENT DISEASES AND DEATHS	4.25	3.99	3.46	3.56

The following table exhibits the causes of the transfers to hospital, with the ratios per thousand, as distributed among the various classes of disease, together with those of the two preceding years:

Diseases.	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic	7.71	26.8	16.97
Constitutional	28.58	27.2	29.91
LOCAL DISEASES:			
Diseases of the nervous system	6.12	6.8	7.63
Diseases of the eye	3.63	3.0	3.39
Diseases of the ear	.90	1.4	1.06
Diseases of the teeth	.22	1.6	
Diseases of the circulatory system	4.09	3.8	2.54
Diseases of the respiratory system	17.01	18.0	16.33
Diseases of the digestive system	8.39	11.0	16.12
Diseases of the genito-urinary system	10.89	12.0	12.72
Diseases of the locomotive system	.68	1.2	1.48
Diseases of the integumentary system	3.39	10.4	8.69
Diseases of the absorbent system	2.26	2.6	3.60
Non-malignant tumors and cysts	.45	.2	.84
POISONS	.68	.2	1.90
VIOLENT DISEASES AND DEATHS	11.79	5.6	12.93

The invaliding from the service is grouped under the following classes, the ratios per thousand being also given for the two preceding years:

Diseases.	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic.....	.22	.....	.21
Constitutional.....	1.36	.80	.21
LOCAL DISEASES:			
Diseases of the nervous system.....	.68	.40	.84
Diseases of the eye.....	.22	.20	.....
Diseases of the circulatory system.....	.22	.20	.21
Diseases of the respiratory system.....	.90	.40	.21
Diseases of the digestive system.....	.68	.40	.21
Diseases of the genito-urinary system.....	.68	.....	.63
Diseases of the locomotive system.....	.....	.....	.21
Diseases of the integumentary system.....	.68	.....	.21
VIOLENT DISEASES.....	.90	.20	.42

The following table shows the invaliding from the various vessels in order of frequency, the ratio per thousand being also given for the two preceding years:

Ships.	1880.		1881.		1882.	
	To hospital.	From serv-ice.	To hospital.	From serv-ice.	To hospital.	From serv-ice.
Dale.....	.....	8.77	147.05	.....	748.79	.....
Alarm.....	360.00	.....	904.86	.....	375.00	.....
Nantucket.....	.....	.....	.....	.....	346.16	.....
Passaic.....	125.00	.....	314.71	.....	322.03	.....
Colorado.....	133.36	.....	135.72	.....	253.67	.....
Tallapoosa.....	72.00	.....	8.08	.....	248.00	.....
Enterprise.....	.....	.....	.....	.....	217.87	.....
St. Louis.....	126.43	11.49	158.01	.....	213.11	.....
Wyandotte.....	50.00	.....	111.11	.....	205.88	.....
Constellation.....	.....	.....	.....	.....	205.47	.....
Portsmouth.....	123.93	29.91	178.94	7.01	200.00	.....
Bache.....	24.30	.....	51.00	.....	200.00	.....
Gedney.....	.....	.....	100.00	.....	172.41	.....
Wabash.....	50.50	20.20	248.18	.....	168.89	.....
Montauk.....	.....	.....	.....	.....	162.79	.....
Despatch.....	101.34	.....	50.00	.....	161.76	.....
Lehigh.....	.....	.....	.....	.....	142.85	.....
Franklin.....	83.33	4.38	215.78	.....	140.54	5.40
Ajax.....	116.66	.....	93.75	.....	138.88	.....
Vandalia.....	88.37	18.60	.....	.....	133.33	.....
Jamestown.....	.....	.....	.....	.....	129.03	.....
Miantonomoh.....	.....	.....	.....	.....	121.20	.....
Alliance.....	153.11	.....	117.97	.....	98.80	.....
Mayflower.....	.....	.....	.....	.....	90.90	.....
Powhatan.....	.....	.....	117.64	.....	87.64	.....
Kearsarge.....	35.89	.....	46.53	5.18	85.00	.....
Minnesota.....	152.34	11.71	171.42	2.59	80.50	5.00
New Hampshire.....	18.51	.....	98.65	.....	75.24	29.13
Manhattan.....	.....	.....	.....	.....	76.92	.....
Tennessee.....	36.05	.....	44.70	.....	72.18	.....
Catskill.....	.....	.....	.....	.....	66.66	.....
Saratoga.....	90.80	.....	118.64	.....	62.93	.....
Mahopac.....	125.00	.....	117.64	.....	62.50	.....
Michigan.....	.....	.....	.....	.....	51.95	21.97
Standish.....	.....	.....	11.23	11.23	25.00	.....

The deaths were distributed as follows, the ratio per thousand being contrasted with that of the two preceding years :

Diseases.	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic.....	.45	0.4	0.84
LOCAL DISEASES:			
Diseases of the nervous system.....	.45	0.4	0.21
Diseases of the circulatory system.....		0.2	0.42
Diseases of the respiratory system.....	.45	0.2	0.42
Diseases of the digestive system.....		0.2	
Diseases of the genito-urinary system.....			0.21
Non-malignant tumors and cysts.....			0.21
VIOLENCE.....	1.36	2.6	1.69

GENERAL DISEASES.

ZYMOTIC GROUP.

The total number of cases returned in this group was 623, a falling off as compared with 1881 of 80 cases. The ratio given was $132.15\frac{0}{00}$ against $152.6\frac{0}{00}$ last year. The daily average number sick was $1.98\frac{0}{00}$; of these 80 or $16.97\frac{0}{00}$ were invalided to hospital, and 1 or $21\frac{0}{00}$ from the service. There were 4 deaths or $84\frac{0}{00}$, and 4 were continued to the following year. The average duration of treatment was 5.48 days.

The ratios reported from the British squadron on the same station for the same period were: Admissions, $\frac{0}{00}$; invaliding, $\frac{0}{00}$; death, $\frac{0}{00}$. In the German squadron the zymotic and constitutional diseases yielded a ratio of admissions $73.5\frac{0}{00}$, and an average duration of treatment of 8.6 days.

The distribution of zymotic diseases among the vessels is shown in the following table, the ratios per thousand being compared with those of the three preceding years :

Ships.	1879.	1880.	1881.	1882.
Catskill.....	294.11	352.04	117.64	666.66
Passaic.....	16.66	71.42	388.88	644.06
Manhattan.....	250.00	187.50	71.42	538.66
Lehigh.....	562.50	312.05	166.60	428.57
St. Louis.....	242.42	298.85	425.74	418.03
Mayflower.....	41.47		235.29	363.63
Despatch.....		164.67	250.00	323.52
Tallapoosa.....	72.00	192.00	454.54	320.00
Franklin.....	153.06	53.19	336.84	286.48
Montauk.....		50.00	240.40	255.81
Alarm.....	450.00		1,593.78	250.00
Standish.....	37.81		500.00	250.00
Nantucket.....				230.76
Constellation.....	97.91	115.21	214.08	219.17
Enterprise.....				195.53
Michigan.....	160.00	270.00	22.47	191.17
New Hampshire.....	265.15	101.87	112.10	160.19
Bache.....	23.80		333.33	160.00
Ajax.....	370.37		62.50	138.88
Wyoming.....			233.33	136.76
Powhatan.....	127.27	99.20	112.56	111.55
Gedney.....	60.27	205.88	133.23	103.44
Portsmouth.....	308.33	141.02	277.19	88.52
Alliance.....			78.65	81.39
Saratoga.....	57.25	21.80	80.50	73.42
Dale.....		17.54	58.82	73.17
Tennessee.....	4.79	52.88	42.35	70.06
Colorado.....	60.17	48.48	35.88	62.50
Kearsarge.....	10.32	87.17	108.80	55.00
Minnesota.....	41.91	54.68	150.64	45.00
Yantic.....		28.41	117.24	42.75
Wabash.....	54.05	50.50	169.69	42.01
Vandalia.....	167.44	32.55	30.70	41.02
Miantonomoh.....				30.30

Catarrhus epidemicus.—Three cases of this affection were returned, a ratio of $.63\frac{0}{0}$. Of these, two recovered and one was invalided to hospital. All the cases occurred on board the Tallapoosa.

Erysipelas.—There were returned 5 cases of erysipelas, a ratio of $1.06\frac{0}{0}$ as against $1.8\frac{0}{0}$ in 1881. Two were returned to duty, and 3 invalided to hospital, and the loss of service was 18 days. Two cases occurred on the Colorado, 1 on the St. Louis, and 1 on the Constellation.

Febricula.—There were 40 cases of this disease reported, a ratio of $8.48\frac{0}{0}$, while that of last year was $12.0\frac{0}{0}$. All but 2, which were transferred to hospital, recovered, and the total loss of service was 139 days. Ten cases occurred on the New Hampshire, 8 on the Portsmouth, 6 on the Alliance; the others being distributed in smaller numbers among various ships.

Febris cerebro-spinalis.—One case was reported from the New Hampshire, which terminated in death after an illness of 4 days.

Febris continua simplex.—Twenty-seven cases of simple continued fever were returned, giving a ratio of $5.72\frac{0}{0}$ as against $10.2\frac{0}{0}$ last year, a reduction of nearly one-half. Of these, 21 were returned to duty, and the remainder were invalided to hospital. The total loss of service from these cases was 290 days, and the daily average number of sick was $.16\frac{0}{0}$. The cases were contributed chiefly by the training-ships Portsmouth and Saratoga, as was the case last year.

Febris enterica.—The returns gave 8 cases of typhoid fever, a ratio of $1.69\frac{0}{0}$, an increase of 2 cases, or $.49\frac{0}{0}$ over that of last year. Three recovered on board, 4 were invalided to hospital, and 1 died. The loss of service amounted to 195 days, and the average duration of treatment was 24.37 days. Two cases occurred each on the Tennessee and Michigan, and the others were single cases on the New Hampshire, Portsmouth, Kearsarge, and Wabash. The death occurred on the Portsmouth.

Febris intermittens.—A total of 389 cases were given under this head, a ratio of $82.50\frac{0}{0}$. These figures indicate an increase of $6.92\frac{0}{0}$ over the ratio of the previous year, and a progressive increase for the two preceding years. The number discharged to duty was 349; 37 were invalided to hospital, and 2 died. The time lost from this disease was 1,590 days, more than twice the amount of last year, when it was but 443 days. The average duration of treatment was 4.08 days, and the daily average number of sick was $.92\frac{0}{0}$. The largest number of cases were reported from the St. Louis, 37; the Passaic contributed 37, the Franklin 32, the Tallapoosa 28, the New Hampshire, 26, the Enterprise 20, the Despatch 19, and the remainder was distributed in smaller numbers among other vessels. The deaths occurred on the Tennessee and Manhattan.

Passed Assistant Surgeon C. A. Siegfried, in his sanitary report, gives the following account of intermittent fever as seen by him on the malarious station of James River:

The usual history of an every-day moderate case of intermittent fever, or "chills," as it is called, begins without warning, the person at once becoming cold and shivering either by short exacerbations, or a long, continuous shake, lasting in either instance for an hour or two; then follows febrile action, or reaction, to a heat of from 103° to 106° , lasting several hours, with more or less nausea, perhaps vomiting, and some tingling of the surface. The pulse does not keep pace with the temperature, it often being at ninety beats to the minute, whilst the thermometer records 104° F. The eyes are not commonly changed in appearance. The tongue is usually coated white or whitish-yellow, and is moist. Constipated bowels, and pains, various and variable, are frequent symptoms. A severe case, at once dangerous to life, is ushered in by a prolonged, tenacious chill, discolorations of skin and mucous membranes, with extreme nausea, and vomiting of all matters in the stomach, and possibly small quantities of blood; reaction is slow and difficult. The case then goes on with all its symptoms of fever, pain, intestinal and stomach difficulties exaggerated, and if a re-

lapse or another chill occurs within thirty-six hours it becomes critical. Sudden death may occur at any time by syncope, paralysis of the heart, or by asphyxia. There are no signs of positive value at any time as to whether the disease will be severe or mild. Severe cases happen in some seasons very generally, as in this year; in other seasons it is not so, and people are not conscious of any great amount of illness existing.

The prophylactic measures hereabouts commonly in use are pills of nux vomica, resin of podophyllin, colocynth, and quinine; powders of calomel and quinine, or of gray powder, ipecac, and quinine; infusions of bitter aromatics—barks and roots; cordials of red bark, gentian, and spirits; “liver regulators” *ad libitum*, and other similar quack mixtures. It is customary for every member of a family to have a daily morning dose, either a pill, powder, or a wineglassful of cordial or liver regulator. When the fever is, however, on, the common way of administering quinine is by small and frequently repeated doses, a prejudice existing against the use of large doses. It is said that inhabitants of this section cannot stand large doses of quinine; I have not been able to ascertain the reason of this notion.

The onset of the disease most frequently occurs in the middle of the day, and in this season is mainly of quotidian type, though one very severe case, with much gastric trouble, was double quotidian. The average duration has been three days, under close observation and treatment, followed by the cautious use of remedies at intervals for a week or two longer. Severe cases, lasting a week or more, of remittent and mixed types, require much care in treating the digestive system, in dieting, and in giving the curative remedy.

Upon being called to a case in the cold stage, of only moderate severity, I at once employed a drink of small bulk, composed of whisky, morphine, a little capsicum, and sirup of ginger. On reaction, provided there is no constipation or yellowness of surface, tongue or conjunctivæ, quinine in three-grain doses, every two hours, until cinchonism is produced, is administered. Heat and similar external means are appropriately used.

¶ In some cases calomel, quinine, and soda bicarb., in combination, after the chill passes off, is used; or the pills of podophyllin and quinine until the bowels briskly move, when the latter remedy, uncombined or with aromatic powder, does best. Severe cases need sinapisms, hot flannels, hot brandy bathing; and by mouth, cracked ice, bismuth, with hydrocyanic acid or morphine, to relieve the gastric symptoms, quinine with spirits, by the rectum or hypodermically, and absolute recumbency and quiet. In the delirium, extremely small doses of belladonna extract do much good, and external means, with constant good nursing, is much of the battle. Good whisky, hot, used externally and internally, is of value throughout, but in small quantities. Quinine to the extent of 40 or 50 grains in an ounce of warm spirits, injected far up the bowel, and the hypodermic use of pure whisky or ether, in 5-minim doses, are formidable weapons in very serious or extreme cases. No restriction is placed on drink if it can be borne by the stomach. When feeding becomes possible, small quantities of meat essence alone, or poured over well-prepared plain rice, toasted bread, raw eggs beaten up with good wine, or eggs in any form, milk with lime-water, gruels and soups, I have found available. Later on, arsenic, acids, and “tonics” of iron, strychnine, &c., are much given. In many cases iron cannot be borne, nor can arsenic be given many days—producing dangerous irritation of the intestinal tract promptly, even in small doses.

The remotely situated native farmer will commonly treat a case by simply giving a half-teaspoonful of calomel on the day of the chill; next day more calomel, perhaps combined with some preparation of cinchona or quinine, continuing this plan with little variation, more or less whisky being included, until the disease passes off. By this method it can be seen how readily the physical condition can be wrecked, though there are prompt cures in many instances. Many specimens of haggard, dilapidated countrymen are constantly met with, mainly the result of much ignorant dosing, their faces withered and pinched, and not a healthy tint to be found on any part of their bodies.

The colored people are not exempt from the disease, though not apparently so much affected as the whites are. A colored invalid is everlasting, and I am inclined to believe that organic lesions more rapidly follow this disease in this race. Whether poverty or neglect are entirely the cause of this is hard to say conclusively.

In this condition of affairs the first frost is looked forward to with glad anticipation, for then follows a respite, at once a relief to the well and a saving boon to the sick. Yet all through the year (for warm weather is liable to occur throughout) the effects, or at least the obscure and intangible influence of the poison, can be seen to mark nearly all the inhabitants in one way or another, too vague and manifold to here follow into details.

Of the nature of the poison we call “malarious,” it is not the purpose here to attempt any explanation.

Febris remittens.—Fifty-eight cases make the total under this head, a ratio of $12.30\frac{0}{0}$ as against $14.2\frac{0}{0}$ last year. Of this number 48 were returned to duty, 8 were invalided to hospital, 1 from the service, and 1 was continued. The loss of service amounted to 541 days, nearly 100 over that of 1881, and the daily average number of sick was $.31\frac{0}{0}$. The chief contributors were the Franklin, 16 cases; the Powhatan, 12 cases; and the New Hampshire, Saratoga, Wyoming, Wabash, and Despatch, each of which reported 3 cases.

Morbilli.—The 3 cases reported occurred as single cases on the Tennessee, Wabash, and St. Louis. They were all transferred to hospital upon their appearance.

Parotitis.—Two cases of mumps were noted, occurring on the Franklin and Constellation, both of which were invalided to hospital.

Roseola.—Two cases of this affection appeared on the Tennessee and 1 on the Franklin, making a ratio of $.63\frac{0}{0}$. All were returned to duty, after an average duration of sickness of 30.33 days, the total loss of service amounting to 90 days.

Rötheln.—The Constellation returned 2 cases of German measles, 1 of which recovered on board, and the other was invalided to hospital. The loss of service was 8 days.

Scarlatina.—An epidemic of scarlet fever was reported from the Saratoga, 5 cases having occurred, all of which were invalided to hospital immediately upon their appearance.

Vaccina.—There were 70 cases of this affection recorded, a ratio of $14.84\frac{0}{0}$ as against $16.8\frac{0}{0}$ last year. The loss of service amounted to 514 days, or 7.34 days for each case. Sixty-seven were returned to duty, 1 was invalided to hospital, and 2 continued under treatment.

Varicella.—The single case of this affection occurred on the Alarm, and was invalided to hospital.

Variola.—One case of small-pox appeared on the Tennessee, which was transferred to hospital on the second day. Prompt measures sufficed to prevent the spreading of the disease.

The following exhibit indicates the results of vaccination in this squadron:

Report of vaccination.
NORTH ATLANTIC STATION.

Vessels.	No evidence of previous vaccination.		Presenting good cicatrices.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Alarm.....	24	15	3	1	1	4	48
Alliance.....	65	80	14	6	8	7	180
Bache.....	10	26	2	1	.....	.....	39
Colorado.....	88	426	15	3	2	11	545
Constellation.....	36	49	13	15	.....	.....	113
Enterprise.....	38	139	.....	1	.....	.....	178
Franklin.....	38	116	18	13	2	4	191
Gedney.....	1	21	5	1	.....	3	31
Jamestown.....	4	8	1	1	.....	.....	14
Kearsarge.....	22	21	3	2	1	.....	49
Michigan.....	36	50	8	7	0	1	102
Minnesota.....	66	146	40	47	.....	.....	299
Montauk.....	3	7	.....	4	1	1	16
New Hampshire.....	101	300	21	5	2	4	433
Passaic.....	12	44	1	2	1	5	65
Portsmouth.....	31	88	7	19	0	5	150
Powhatan.....	10	44	5	5	0	0	64

Report of vaccination—Continued.

NORTH ATLANTIC STATION.

Vessels.	No evidence of previous vaccination.		Presenting good cicatrices.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
St. Louis	59	169	38	123	8	19	416
Tallapoosa	92	107	0	0	0	0	199
Tennessee	475	119	9	1	17	4	625
Vandalia	72	78	2	0	9	5	166
Wabash	295	296	0	0	1	6	598
Wyandotte	20	17	17	6	4	3	67
Wyoming	9	56	27	8	0	3	103
Yantic	3	10	5	8	0	0	26
Total	1,610	2,432	254	279	57	85	4,717
Per cent. of cases	85.6		11.3		3.0		.....
Per cent. of successful	39.8		47.6		40.1		40.7

CONSTITUTIONAL DISEASES.

The number of cases reported under this group amounted to 475, a ratio of $100.76\frac{0}{00}$, being an increase of $10\frac{0}{00}$ over that of the preceding year. There were 328 who were cured, 141 who were sent to hospital, 1 was discharged from the service, and 5 were continued. The total loss of service was 4,771 days, and the average period of treatment 10.04 days.

The reports from the British squadron on this station give: admissions, — $\frac{0}{00}$; invaliding, — $\frac{0}{00}$; deaths, — $\frac{0}{00}$.

The following are the ratios indicating the prevalence of constitutional affections on the vessels of the squadron during four years:

Ships.	1879.	1880.	1881.	1882.
Tallapoosa	80.00	152.00	171.71	296.00
Alliance		257.66	202.24	226.74
Lehigh				214.29
Kearsarge	82.63	112.82	78.75	175.00
Wabash	54.05	80.80	96.96	151.26
Gedney			166.66	137.93
Jamestown				137.09
Passaic	66.66	125.00	92.50	135.59
Enterprise				128.49
Colorado	97.42	75.75	76.76	125.00
Portsmouth	58.33	106.83	80.70	118.03
Wyoming				109.09
Mayflower				90.90
Tennessee	11.98	84.13	108.23	89.17
New Hampshire	68.18	129.62	53.81	87.37
Ajax				83.33
Vandalia	204.65	148.83	100.87	82.00
St. Louis	161.61	114.94	29.70	81.96
Yantic		14.21	131.03	78.01
Minnesota	101.79	136.71	114.58	75.00
Dale			117.64	73.17
Mahopac				62.05
Michigan	50.00	190.00	89.88	54.95
Powhatan	160.60	146.82	62.82	51.79
Standish				50.00
Alarm	200.00	200.00	189.18	50.00
Montauk	58.82	50.00	40.00	46.51
Saratoga	57.25	40.00	63.55	45.45
Despatch		12.66	16.66	44.11
Wyandotte				44.11
Bache	23.80	121.95	76.92	40.00
Nantucket				38.46
Franklin	56.12	65.78	73.15	37.84
Miantonomoh				30.30
Constellation	45.89	84.19	59.52	13.69

Adynamia.—Forty-three cases of this disease were reported, a ratio of $9.10\frac{0}{0}$ as against $7\frac{0}{0}$ last year. Of these, 24 were returned to duty and 19 were invalided to hospital. The total loss of service was 311 days, and the average number of days under treatment 7.23, while the daily average number of sick was $.18\frac{0}{0}$. The largest numbers were on board the Kearsarge (6), and the Tennessee and Alliance, each of which reported 5 cases.

Anæmia.—This affection gave 5 cases, 3 of which happened on the New Hampshire. Three were returned to duty, and the remainder were invalided to hospital. The loss of time amounted to 19 days.

Carcinoma.—A single case of this affection was noted on the Wabash, and was invalided to hospital.

Lumbago.—There were returned of this disease 38 cases, a ratio of $8.06\frac{0}{0}$ as against $2.8\frac{0}{0}$ last year. Of these, 32 were returned to duty, 5 were invalided to hospital, and the remaining one was continued for treatment. The daily number of sick was $.14\frac{0}{0}$ and the total loss of service from this disease was 245 days. The Portsmouth returned the largest number of cases, 7; the New Hampshire 6, and the Enterprise 5, while the remainder were on board other ships in smaller numbers.

Podagra.—Of the 4 cases of gout recorded, 3 occurred on the Tennessee and 1 on the Wyoming. The former were contributed by a single subject, repeatedly admitted, who was once invalided to hospital. The total loss of service was 28 days.

Rheumatismus acutus.—There were 136 cases of this affection returned, a ratio of $28.85\frac{0}{0}$, a slight falling off from that of last year, when it was $29.4\frac{0}{0}$. Of this number, 106 were returned to duty, 29 were invalided to hospital, and 1 was continued. The daily average number of sick was $.86\frac{0}{0}$, and the total loss of service amounted to 1,497 days, while the average duration of treatment was 9.16 days. The cases were chiefly furnished by the following ships: Jamestown 22, Alliance 16, Colorado and New Hampshire 13, and the Tallapoosa 10.

Rheumatismus chronicus.—The returns included 97 cases of chronic rheumatism, a ratio of $20.57\frac{0}{0}$, which, as in the case of the acute variety, shows a reduction since last year, when it was $25.2\frac{0}{0}$. Of the total, 66 were discharged to duty, 29 were invalided to hospital and 1 from the service, while one remained for treatment. The daily average number of sick was $.51\frac{0}{0}$, the total loss of service 889 days, and the average length of treatment 9.16 days. The Alliance reported 13 cases, the Kearsarge and the Tallapoosa each 12, and the remaining cases were generally distributed.

Rheumatismus gonorrhœicus.—A single case of this malady occurred on the Gedney, which recovered on board.

Scrofula.—One case was reported from the New Hampshire, which was returned to duty.

Senectus.—Two men were disabled from the infirmities of age, the cases being reported by the New Hampshire and the Alliance, and that occurring on the latter ship was invalided.

Syphilis primitiva.—Under this head 76 cases were returned, a ratio of $16.12\frac{0}{0}$ as against $14\frac{0}{0}$ in 1881—a small increase. The daily average number sick from this cause was $.53\frac{0}{0}$, and the total loss of time amounted to 928 days. Forty-six cases were discharged to duty and 30 were invalided to hospital. The largest number of cases were noted on the Kearsarge, 10 cases; the Saratoga, 9 cases; the Portsmouth, 6 cases; and the Colorado, Tallapoosa, and Wyoming each gave 5.

Syphilis consecutiva.—The returns included 69 cases of secondary

syphilis, a ratio of $14.63\frac{0}{0}$ as against $9.6\frac{0}{0}$ last year—a considerable increase. The total loss to the service was 768 days, the daily average loss being $44\frac{0}{0}$. There were 44 who recovered on board, and 23 who were transferred to hospital, while two were continued. The principal sufferer from this disease was the Tennessee, which reported 15 cases, and the others occurred in small numbers on other vessels.

Torticollis.—The Franklin returned 1 case of this trouble, which recovered on board.

LOCAL DISEASES.

DISEASES OF THE NERVOUS SYSTEM.

Included under this head there were returned 253 cases, a ratio of $53.66\frac{0}{0}$, a large increase over the numbers of last year, when the ratio was $36.4\frac{0}{0}$. Of this total 211 cases were discharged to duty, 36 were invalided to hospital, and 4 from the service, 1 died, and 1 was continued. The daily average number sick from these diseases was $.72\frac{0}{0}$, the total loss of service was 1,249 days, and the average duration of each case was 4.93 days.

In the English squadron the ratios were, admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; deaths, $\frac{0}{0}$.

As distributed among the various ships, the following table for four consecutive years shows the ratios:

Ships.	1879.	1880.	1881.	1882.
Dale		35.08	29.41	365.85
Constellation	3.05	35.44	47.61	356.00
Enterprise				167.59
Alliance		49.07	111.12	114.41
Jamestown				112.90
Mayflower				90.90
Tallapoosa		38.00	60.60	88.08
Manhattan				76.92
Lehigh				71.43
Wabash	13.51	15.15	24.24	67.22
Mahopac			58.82	65.05
Kearsarge	87.80	164.10	67.35	65.00
Colorado	31.51	27.27	21.05	55.14
Alarm	50.00	120.00	27.02	50.00
Vandalia	46.51	46.51	13.11	46.15
Franklin	50.61	4.38	20.28	37.84
Michigan	10.00	20.00	22.47	32.96
Despatch		37.99	16.66	29.41
Yantic		35.51	137.93	28.00
Portsmouth	95.83	34.18	56.14	26.22
Tennessee	7.19	49.86	7.05	25.47
Minnesota	35.02	31.24	18.18	25.00
St. Louis	10.10	22.94	29.70	24.59
Montauk				23.25
New Hampshire	53.03	64.18	35.87	19.41
Passaic	116.66	17.85	18.51	16.94
Wyandotte				14.70
Wyoming			66.66	9.99
Powhatan	75.75	35.71	31.41	3.98

Apoplexia.—Two cases of apoplexy were recorded on the Kearsarge and Wabash, both of which recovered on board.

Cephalalgia.—Forty-seven cases in all were reported of this disease, 2 of which were invalided to hospital, and the remainder recovered. The ratio furnished was $9.96\frac{0}{0}$, as against $8.6\frac{0}{0}$ last year. The loss of service was 140 days, or 2.97 days for each case. The Alliance was the largest sufferer, 17 cases having occurred; the Constellation had 8, and the Enterprise 6.

Cerebritis.—The single case of this affection occurred on the Enterprise, and it was immediately sent to hospital.

Chorea.—The New Hampshire and Portsmouth each reported a case of this malady, both of which were invalided to hospital.

Convulsio.—There were 4 cases of this affection, double the number of last year, and giving a ratio of $.84\frac{0}{0}$. They occurred on the Kearsarge, St. Louis, Alarm, and Mayflower. Two were returned to duty, and 2 invalided to hospital without delay.

Dementia.—There were 5 cases of this affection, occurring singly on various ships, making a ratio of $1.06\frac{0}{0}$. Four were invalided to hospital, and 1 from the service.

Epilepsia.—Thirteen cases were reported of this malady, a ratio of $2.75\frac{0}{0}$, or nearly the same as last year, when it was $2.8\frac{0}{0}$. Five cases were returned to duty, 5 invalided to hospital, and three from the service. The loss of service was 175 days, the average duration having been 13.46 days. Three cases occurred on the Tennessee, and 2 each on the New Hampshire, Colorado, Enterprise, and Michigan.

Hysteria.—Six cases of this disease were noted, giving a ratio of $1.27\frac{0}{0}$. The loss of service was 34 days, or 5.66 days for each case. Four were returned to duty, and the remainder were invalided to hospital. One-half the cases happened on the Tennessee.

Insolatio.—Five cases of sunstroke were returned; a ratio of $1.06\frac{0}{0}$, all of which recovered on board ship, after an average duration of 4.8 days. They occurred on the Tennessee (2), Colorado, Minnesota, and Constellation.

Insomnia.—The Enterprise, Montauk, and Mahopac each reported a case of this affection, 1 of which recovered on board, and the others were invalided to hospital.

Mania.—Four cases of mania occurred, 2 of which recovered, and 2 were transferred to hospital, after short periods of treatment.

Melancholia.—There were also 4 cases of this affection, which were chiefly on the Tennessee. Two were invalided to hospital, and 2 recovered on board.

Meningitis.—The New Hampshire, Jamestown, and Vandalia each reported a case of this disease, the former of which proved fatal. The other 2 were transferred to hospital.

Nausea marina.—Fifty-nine cases of sea-sickness were sufficiently severe to require a relief from duty, making a ratio of $12.51\frac{0}{0}$, a very large increase over that of last year, when it was but $2.6\frac{0}{0}$. All the cases were returned to duty after an average period of treatment of 3.06 days, making a total loss to the service of 181 days. The cases were chiefly reported from the Jamestown, Constellation, and Dale.

Neuralgia.—There were reported of this disease 75 cases, a ratio of $15.91\frac{0}{0}$, as against $13.2\frac{0}{0}$ last year. There were 66 who returned to duty, 8 were transferred to hospital, and 1 was continued. The daily average number sick from this affection was $.28\frac{0}{0}$, and the total loss of service amounted to 496 days, the average period of treatment having been 6.61 days. The Colorado and Jamestown each contributed 10 cases, the Enterprise 9, and the Franklin 6.

Neuritis.—The Kearsarge reported the single case of this affection, which recovered after 25 days of treatment.

Paralysis.—One case of paralysis happened, which was reported from the Wabash, and was invalided to the hospital on the second day.

Pleurodynia.—There were 7 cases of this affection, $1.48\frac{0}{0}$, which recovered, with one exception, which was transferred to hospital. The loss of service was 77 days.

Sciatica.—The St. Louis gave 1 case of this affection, which was under treatment for 21 days, and finally recovered.

Vertigo.—Ten cases of this disease were returned, or $2.12\frac{0}{0}$, as against $3.6\frac{0}{0}$ last year. All were returned to duty, the loss of service amounting to 24 days.

DISEASES OF THE EYE.

There was a considerable increase in the number of these cases, as compared last year, when the ratio was $12.6\frac{0}{0}$. The number included in the returns of 1882 was 72 or $15.9\frac{0}{0}$. Of this number, 55 were returned to duty, 16 were transferred to hospital, and 1 was continued for treatment. The daily average sick amounted to $.72\frac{0}{0}$, and the total loss from eye diseases was 1,249 days.

Amaurosis.—The New Hampshire, Colorado, and Constellation each afforded a case of this disease, the latter of which was invalided to hospital. The loss of service was 41 days.

Asthenopia.—Two cases were returned from the Jamestown and Vandalia, both of which were invalided to hospital.

Blepharitis.—The Constellation returned a case of this affection, which was of short duration, and recovered on board.

Conjunctivitis.—This affection furnished more cases than all the rest of the class, the total amounting to 40, a ratio of $8.48\frac{0}{0}$. Four were transferred to hospital and 36 were cured. The loss of service was 201 days, and the average duration of treatment 5.02 days. The ships making the largest returns were the New Hampshire 7, Alliance 5, Colorado and Powhatan each 3.

Hordeolum.—There were but 3 cases of this trouble, and they were reported from the Powhatan, Wabash, and St. Louis. They were all speedily returned to duty.

Iritis.—Eight cases of iritis appeared on the returns, or $1.69\frac{0}{0}$. Six of these were cured on board and 2 were sent to hospital. The loss of service was 85 days, the average length of treatment having been 10.62 days. The New Hampshire, Tallapoosa, and Wyoming furnished nearly the whole of the cases.

Keratitis.—One case was returned from the Enterprise which was under treatment for 39 days before recovery.

Ophthalmia.—But 2 cases of this affection were recorded, and these occurred on the Colorado and Minnesota. The latter was invalided to hospital.

Retinitis.—There were 4 cases of this disease, 2 of which recovered on board, and 2 were transferred to hospital. The total loss resulting was 24 days.

Sclerotitis.—The single case of this disease was recorded on the Enterprise, and was 25 days under treatment, finally recovering.

Ulcus corneæ.—Seven cases occurred, a ratio of $1.48\frac{0}{0}$, of which 3 recovered on board, and 4 were transferred to hospital. The loss of service was 71 days, and the average duration of treatment 10.14 days. They occurred on the Franklin, Powhatan, and Minnesota.

DISEASES OF THE EAR.

Under this group were classed 33 cases, giving a ratio of $6.99\frac{0}{0}$ as against $4.2\frac{0}{0}$ last year. The recoveries were 28, and the invalided 5, while the loss of time amounted to 255 days. The daily average number of sick from these affections was $.14\frac{0}{0}$, and the average period of treatment 7.72 days. The largest sufferer from these diseases was the Tallapoosa, whose ratio was $40\frac{0}{0}$, and the next was the Enterprise, which yielded $16\frac{0}{0}$.

DISEASES OF THE TEETH.

The number of cases falling under this head was 8, the same number which occurred last year, amounting to $1.69\frac{0}{0}$. All recovered on board, and the loss of service amounted to but 22 days.

DISEASES OF THE CIRCULATORY ORGANS.

The diseases falling within this class contributed a total of 32 cases and a ratio of $6.78\frac{0}{0}$ as against $7.4\frac{0}{0}$ last year. The recoveries were 17, and the invalided 13, 1 of which was from the service, while there were 2 deaths. The daily average sick was $.14\frac{0}{0}$, and the average duration of treatment was 7.90 days; the total loss of service amounted to 253 days. The Vandalia and the Colorado contributed the largest contingent of these diseases, the ratio of the former being $30.76\frac{0}{0}$ and of the latter $18.38\frac{0}{0}$.

Aneurysma.—The Wabash reported 2 cases of this disease, both of which were invalided to hospital, and the Powhatan 1, which terminated fatally. The loss of time was 50 days.

Angina pectoris.—One case was reported from the Colorado, and it was transferred to hospital after 6 days of treatment.

Dilatatio cordis.—The Colorado also reported 1 case of sickness from dilated heart, which, however, proved of short duration.

Hypertrophia cordis.—The single case of this affection occurred also on the Colorado, and was disposed of by invaliding to hospital.

Morbi valvularum cordis.—Seven cases made the total under this head, only 1 of which returned to duty. Four were invalided to hospital, 1 from the service, and 1 died. The ratio contributed was $1.48\frac{0}{0}$, the daily ratio $.01\frac{0}{0}$, the average period of treatment 3.85 days, and the total loss of service 27 days. Two cases occurred on the New Hampshire and the others singly on various ships.

Palpitatio.—This disease furnished one-half the total for the class. The ratio was $3.39\frac{0}{0}$ and the loss of service amounted to 146 days. The Vandalia contributed 5 cases, the Portsmouth 3, and the Tennessee 2.

Phlebitis.—The Tennessee reported 1 case of this affection, which recovered after 10 days of treatment.

Syncope.—This case occurred on the Tallapoosa and was only briefly under treatment.

Varix.—The Colorado returned 1 case, which recovered on board after 8 days of attention.

DISEASES OF RESPIRATORY SYSTEM.

These affections occurred in 422 cases and gave a ratio of $89.52\frac{0}{0}$, showing a diminution from that of last year of $106.2\frac{0}{0}$. The loss of time was 3,233 days, about equalling that of the preceding year. The number of cases returned to duty was 332. Seventy-seven were invalided to hospital, 1 from the service, 2 died, and 10 were continued for treatment. The daily average number of sick was $1.87\frac{0}{0}$ and the average duration of treatment 7.66 days.

In the English squadron the ratios were, admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$. In the German squadron the admission ratio was $34.3\frac{0}{0}$ and the average duration of treatment 17.6 days.

The subjoined table of ratio per thousand shows the relative frequency of this class of diseases for the period of four years:

Ships.	1879.	1880.	1881.	1882.
Jamestown.....				274.19
Michigan.....	80.00	120.00	101.11	219.78
Enterprise.....				207.04
Alliance.....		164.29	347.69	145.34
Tennessee.....	40.75	149.03	127.05	127.38
Portsmouth.....	133.33	64.10	126.31	104.90
Passaic.....	66.66	17.85	74.07	101.67
New Hampshire.....	22.22	111.11	67.21	89.80
Wabash.....	54.05	45.45	48.48	84.03
Vandalia.....	102.32	148.83	39.47	76.93
Nantucket.....				76.92
Powhatan.....	269.69	67.46	107.32	75.69
Alarm.....	50.00	4.40	135.13	75.50
Lehigh.....	125.00	125.00	83.33	71.43
Franklin.....	35.71	39.47	52.63	70.27
St. Louis.....	141.41	91.95	29.70	65.58
Mahopac.....				62.5
Minnesota.....	155.68	216.79	161.03	60.5
Kearsarge.....	92.97	87.17	46.63	55.5
Standish.....				50.00
Saratoga.....	72.51	69.09	177.96	48.96
Tallapoosa.....	136.00	120.00	121.21	40.24
Colorado.....	140.40	72.72	48.36	36.76
Gedney.....		117.64	100.00	34.48
Yantic.....		7.11	89.65	28.36
Wyoming.....			33.33	27.27
Dale.....				24.39
Montank.....		50.00	120.00	23.25
Wyandotte.....			55.55	14.70
Constellation.....		50.00	120.00	13.69

Asthma.—There were 6 cases of this disease, a ratio of $1.69\frac{0}{00}$ as against $1.2\frac{0}{00}$ last year. Five of these recovered on board, and the remainder were transferred to hospital. The loss of service was 59 days, and the average duration of treatment 7.37 days. Three of the cases were reported from the Powhatan, repeated admissions of the same subject, and the others occurred singly on other ships.

Bronchitis acuta.—There were reports of 168 cases of this affection, a ratio of $35.63\frac{0}{00}$, very nearly that of last year, when it was $33.4\frac{0}{00}$. The recoveries on board were 140; 21 were invalided to hospital, and 7 were continued. The daily average sick was $.81\frac{0}{00}$, and the average duration of treatment 8.36 days, making a total loss of time of 1,405 days. The Jamestown suffered most largely, reporting 50 cases, which occurred chiefly during her exposure in making the passage around Cape Horn. The New Hampshire returned 23 cases, the Enterprise 19, and the Portsmouth 17.

Bronchitis chronica.—The number of cases falling under this head was 36, a ratio of $7.63\frac{0}{00}$, as against $5.67\frac{0}{00}$ last year. Of these, 18 returned to duty, 17 were transferred to hospital, and 1 was continued. The daily average was $17\frac{0}{00}$, and the average duration of treatment 8.36 days, making a total loss of service of 301 days. The Jamestown and Enterprise contributed most largely to these numbers.

Catarrhus.—Under this head were enrolled 140 cases, giving a ratio of $29.91\frac{0}{00}$, a large diminution from that of last year, which was $47.6\frac{0}{00}$. The disposition of the cases was, 137 returned to duty, 2 invalided to hospital, and 1 from the service. The loss of time was 622 days, giving an average duration of 4.44 days for each case. The daily average sick amounted to $.36\frac{0}{00}$. The disease preponderated on the Tennessee, Jamestown, and Alliance.

Epistaxis.—The Kearsarge and the Alliance each afforded 1 case, the latter having been transferred to hospital.

Hæmoptysis.—Five cases of this affection were noted, a ratio of $1.06\frac{0}{0}$ as against $2.\frac{0}{0}$ in 1881. Of these, 3 were returned to duty, and 2 were sent to hospital. The loss of service amounted to 83 days.

Laryngitis.—The number of cases of this affection was 16, giving a ratio of $3.39\frac{0}{0}$ as against $3.\frac{0}{0}$ last year. All recovered on board with one exception, which was transferred to hospital. The average duration was 4.25 days, and the loss of service was 68 days. Three cases occurred on the Portsmouth, Powhatan, and Minnesota, respectively.

Phthisis pneumonica acuta.—There were 3 cases of acute phthisis, which were recorded on the Vandalia, Minnesota, and Enterprise. Two were transferred to hospital, the loss of service amounting to 105 days.

Phthisis pneumonica chronica.—A total of 17 cases fell under this head, giving a ratio of $3.60\frac{0}{0}$, an increase over that of last year, which was $2.8\frac{0}{0}$. But 1 of these returned to duty, while 15 were transferred to hospital, and 1 died. The daily average number of sick was $.14\frac{0}{0}$, the average duration of treatment 14.82 days, and the total loss of time 252 days. The Portsmouth gave 4 cases, and the Vandalia and Saratoga 2, respectively. One of the latter died.

Pleuritis.—Nine cases of pleurisy came under notice, the ratio of $1.90\frac{0}{0}$ being considerably lower than that of last year, $4.4\frac{0}{0}$. Five cases were transferred to hospital, and 4 recovered on board. The loss of service was 45 days, the average duration being 5 days. The cases occurred singly on as many ships.

Pneumonia.—There fell under this head 18 cases, giving a ratio of $3.81\frac{0}{0}$ as against $4.6\frac{0}{0}$ last year. Seven were discharged to duty, 9 to hospital, and 1 died. The average ratio of sick, daily, was $.16\frac{0}{0}$, the average duration of treatment 16.16 days, and the total loss of time 291 days. The Tennessee reported 4 cases, the largest number, and the Saratoga and New Hampshire each contributed 3. The Michigan had 2 cases, one of which was fatal.

DISEASES OF THE DIGESTIVE SYSTEM.

Falling within this class of diseases there were returned 635 cases, making a ratio of $134.70\frac{0}{0}$, a considerable reduction from that of 1881, which was $155.4\frac{0}{0}$. Those discharged to duty numbered 553, while 76 were invalided to hospital, 1 from the service, and 5 were continued. The daily average number of sick was $1.70\frac{0}{0}$, the average duration of treatment 4.61 days, and the loss of time amounted to 2,932 days, more than 600 less than last year. The Constellation was by far the greatest sufferer from this class of diseases, reporting a ratio of $657.53\frac{0}{0}$, followed by the Mayflower, $545.45\frac{0}{0}$. In the aggregate, the statistics show a much less prevalence of this class of diseases than for several years.

In the English squadron the ratios were: admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$. In the German squadron the admission ratio was $117.6\frac{0}{0}$, and the average duration of treatment 6.4 days.

The following table exhibits the comparative frequency of these affections among the various ships, the ratios being also given for the three preceding years:

Ships.	1879.	1880.	1881.	1882.
Constellation	85.67	203.83	202.38	657.54
Mayflower	96.80	-----	235.29	545.45
Standish	25.15	-----	333.33	450.00
Dale	-----	96.94	264.70	439.02
Enterprise	-----	-----	-----	234.97
Bache	71.42	195.12	179.48	200.00
New Hampshire	90.90	64.81	130.04	196.17
Tallapoosa	3.26	216.00	404.04	192.80
Alliance	-----	233.12	230.33	174.41
Michigan	70.00	140.00	280.89	153.86
Jamestown	-----	-----	-----	153.21
Wabash	103.60	65.65	78.78	151.26
Ajax	148.14	66.66	156.55	138.88
Vandalia	209.30	167.44	35.08	138.46
Kearsarge	170.40	312.82	272.43	125.00
Passaic	33.33	17.85	166.66	118.65
Wyoming	-----	-----	183.33	118.18
Colorado	74.49	69.69	51.48	117.69
Montauk	-----	-----	32.00	115.39
Minnesota	423.15	665.25	223.37	115.00
Gedney	60.27	117.64	100.00	103.44
Alarm	11.51	1,040.00	378.37	100.75
Portsmouth	23.75	34.18	136.84	98.36
St. Louis	121.21	57.47	59.40	98.35
Franklin	86.73	43.85	178.94	97.29
Tennessee	11.98	139.42	108.23	93.41
Miantonomoh	-----	-----	-----	90.92
Powhatan	378.78	261.90	183.30	79.67
Yantic	-----	28.41	179.31	78.01
Manhattan	-----	-----	-----	76.92
Despatch	-----	25.33	100.00	73.52
Lehigh	-----	312.50	416.66	71.43
Catskill	-----	-----	-----	66.66
Saratoga	80.25	130.90	118.64	41.96
Wyandotte	-----	-----	-----	29.41

Cholera morbus.—There were 23 cases of this affection returned making a ratio of $4.87\frac{0}{0}$, only about one-half that of last year ($9.2\frac{0}{0}$) and a still larger diminution since 1880. All were discharged recovered, and the total loss of service amounted to 58 days, less than one third that of last year. The cases were very generally distributed among the ships.

Colica.—This disease afforded 58 cases, a ratio of $12.30\frac{0}{0}$, very nearly the same as last year. All but 1 were returned to duty, and this was invalided to hospital. The average duration of treatment was 2.43 days, and the total number of sick days was 141. The Alliance gave the largest number of cases, 11, while the Jamestown reported 8. The Saratoga and Portsmouth, training ships, were singularly free from these affections.

Congestio hepatis. Six cases of congestion of the liver appear upon the records, mostly furnished by the Enterprise and Wyoming. Five were cured on board, and 1 was invalided to hospital. The loss of service was 64 days.

Constipatio.—This trouble occurred in 28 cases, a ratio of $5.94\frac{0}{0}$, nearly that of last year, $6.6\frac{0}{0}$. Of these 24 were relieved on board, and 4 were sent to hospital. The average period of treatment was 3.39 days, and the total number of sick days was 95. The Constellation reported the largest number, 11.

Diarrhœa acuta.—There were 191 cases of acute diarrhœa, yielding a ratio of $40.51\frac{0}{0}$ as against $45.4\frac{0}{0}$ last year. The daily average number of sick was $.35\frac{0}{0}$ the average duration was 3.23 days, and the loss of service was 617 days, while last year it amounted to 936. The Constel-

lation suffered most largely here also, reporting 27 cases; next came the Tennessee and Colorado, with 17 and 16 respectively.

Diarrhœa chronica.—Nine cases make up the aggregate of this disease, with a ratio of $1.90\frac{0}{0}$, nearly that of last year, which was $1.81\frac{0}{0}$. Of these 6 recovered and 3 were transferred to hospital. The number of sick days was 34.

Dysentery acuta.—There appeared 14 cases of this affection upon the records, a ratio of $2.96\frac{0}{0}$, a large reduction from that of last year, which was $6.6\frac{0}{0}$. The recoveries on board were 11, and the remaining 3 went to hospital. The average duration of treatment was 5.85 days, and the total loss of time was 82 days. The Enterprise contributed one-half the cases, while the Tennessee and Franklin each gave 2.

Dysentery chronica.—Five cases of this disease were returned, giving a larger ratio than last year, the numbers being $1.66\frac{0}{0}$ and $4\frac{0}{0}$ respectively. Two recovered on board and the remaining 3 were transferred to hospital. The cases occurred on the New Hampshire and Tallapoosa.

Dyspepsia.—There were recorded 24 cases of dyspepsia, a ratio of $5.08\frac{0}{0}$ as against $6.8\frac{0}{0}$ in 1881. Those recovering on board were 16, and 8 were transferred to hospital. The average duration of treatment was 8.04 days, and the total number of sick days was 193. The Enterprise reported the largest number of cases, 7, and the others were generally distributed.

Enteritis.—Five cases of this affection were noted, which occurred singly on as many ships. The ratio yielded was $1.06\frac{0}{0}$, as against $1.2\frac{0}{0}$ last year.

Fistula in ano.—The records contained 4 cases of anal fistula, all of which were transferred to hospital for treatment.

Gastritis.—Four cases of this affection appear on the returns, which recovered on board. The ratio was $.84\frac{0}{0}$.

Gastrodynia.—There were 3 cases of this affection, 2 of which occurred on the Tennessee. All were relieved on board.

Hæmatemesis.—Two cases of this disease occurred, a ratio of $42\frac{0}{0}$. Both were relieved on board ship, the average duration having been 25 days.

Hæmorrhoids.—Of this affection 34 cases were recorded, a ratio of $6.78\frac{0}{0}$, almost that of last year, which was $6.80\frac{0}{0}$. Of this number 26 were relieved on board, 5 were transferred to hospital and remained for treatment. The daily average ratio of sick was $.12\frac{0}{0}$, the average length of treatment 6.93 days, and the total number of sick days was 222 days. The disease was pretty generally distributed, the Vandalia showing the largest number of cases, 4.

Hepatitis acuta.—There were 3 cases of this disease, 2 of which occurred on the Saratoga and 1 on the Portsmouth; the latter was transferred to hospital. The ratio yielded was $.63\frac{0}{0}$, against $.4\frac{0}{0}$ last year.

Hernia.—This disability occurred in 24 cases, a ratio of $5.08\frac{0}{0}$ as against $4.0\frac{0}{0}$ last year. Eleven returned to duty on board, 12 were invalided to hospital, and 1 from the service. The loss of service was 10.16 for each case, and the aggregate loss was 244 days.

Icterus.—Three cases of jaundice were noted, occurring on the Portsmouth, Tennessee, and Franklin. The ratio was $.63\frac{0}{0}$ as against $1.0\frac{0}{0}$ last year. One recovered, and 2 were transferred to hospital. The loss of service was 40 days.

Peritonitis.—A single case of this disease was reported from the Wabash, which was transferred to hospital on the third day.

Pharyngitis.—The number of cases of this disease was 47, making a ratio of $9.96\frac{0}{0}$ as against $6.8\frac{0}{0}$ last year. Of these, 45 recovered and

2 remained for treatment. The loss of service amounted to 191 days, and the daily average number sick was $.11\frac{0}{0}$. The New Hampshire reported 17 cases, the Kearsarge 9, the Enterprise 6, and the Vandalia 4.

Prolapsus ani.—There were 3 cases of this trouble coming under treatment, contributed by the Powhatan and Minnesota. Two were invalided to hospital and one recovered.

Tonsillitis.—The recorded cases of this affection were 141, in the ratio of $29.91\frac{0}{0}$, a considerable reduction from that of last year, when it was $40.0\frac{0}{0}$. The recoveries numbered 129, and 10 were transferred to hospital, while 2 were continued. The daily average sick was $.36\frac{0}{0}$, the average duration of the cases 4.40 days, and the total loss of time reached 621 days, little more than one-half of that of last year. The disease was very generally distributed, but prevailed most largely on the New Hampshire, which reported 40 cases, and the Jamestown 16.

Verues.—Five cases were met with, a ratio of $1.06\frac{0}{0}$ as against $1.6\frac{0}{0}$ last year. Three returned to duty and 2 were sent to hospital. The loss of service was 22 days, or 4.4 days for each case.

DISEASES OF THE GENITO-URINARY SYSTEM.

The number of cases recorded under this class reached 264, in the ratio of $56.0\frac{0}{0}$, an increase as compared with last year, when it was $49.0\frac{0}{0}$. The number of recoveries on board was 195, invalided to hospital 60, from the service 3, 1 died, and 5 were continued to the following year. The daily average number of sick was $1.51\frac{0}{0}$, the average duration was 9.85 days, and the total loss of time was 2,602 days. These figures show a small increase over those for 1881.

The statistics for the British squadron in these waters show: Admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; death, $\frac{0}{0}$. In the German squadron the admission ratio for the venereal diseases only was $108.6\frac{0}{0}$, and the average duration of treatment was 22 days.

The subjoined table of ratios show the distribution of these affections among the several ships for the period of 4 years:

Ships.	1879.	1880.	1881.	1882.
Mayflower.....				484.54
Mahopac.....	125.00		58.82	187.50
Manhattan.....	60.60			153.84
Alliance.....		116.56	95.50	145.34
Catskill.....	117.64		117.64	133.37
Ajax.....	111.11		125.00	111.11
Kearsarge.....	15.49	92.30	82.90	105.00
Alarm.....	100.00	80.00	54.05	100.00
Franklin.....	56.12	8.77	136.84	97.29
Constellation.....	71.42	51.98		95.89
Portsmouth.....	41.66	38.46	31.57	78.56
Lehigh.....				71.43
Passaic.....	16.66			67.79
Tennessee.....	11.98	38.46	44.70	65.82
Enterprise.....				61.44
New Hampshire.....	22.70	27.77	49.32	60.67
Despatch.....			33.33	58.82
St. Louis.....	20.20	11.49	39.60	57.38
Yantic.....		21.31	41.37	56.72
Tallapoosa.....	24.00	24.00	50.50	56.00
Colorado.....	37.24	18.18	35.88	47.79
Wyoming.....			33.33	36.36
Minnesota.....	49.90	74.21	31.16	30.00
Wyandotte.....				29.41
Dale.....		17.54	29.41	24.39
Jamestown.....				24.19
Powhatan.....	124.24	43.65	47.12	23.89
Montauk.....				23.25
Saratoga.....	19.08	58.18	105.93	20.97
Vandalia.....	25.81	69.76	39.47	20.51
Wabash.....	45.04	25.25	18.18	16.80

Albuminuria.—Three cases of this disease were returned, occurring on the Wabash, St. Louis, and Despatch, and all were transferred to hospital.

Balanitis.—Five cases were reported, and all recovered, with one exception, which was still under treatment.

Calculus.—But 1 case of this affection occurred, which was invalided to hospital from the Ajax.

Chancroides.—The number of cases of chancre which were treated during the year amounted to 52, giving a ratio of $11.04\frac{0}{0}$, as against $8.1\frac{0}{0}$ in 1881. There were 43 which were successfully treated on board, 8 were transferred to hospital, and 1 was invalided from the service. The daily average sick rate was $.37\frac{0}{0}$, the average period of treatment 12.53 days, and the total loss of time amounted to 652 days, considerably greater than that of last year. The Tennessee reported the largest number of cases, 15; the Kearsarge gave 5, and the Portsmouth, Franklin, and Minnesota, each 3.

Cystitis.—Nine cases of this disease were mentioned, a ratio of $1.90\frac{0}{0}$ as against $1.8\frac{0}{0}$ in the preceding year. Of this number, 6 were cured on board, 2 were transferred to hospital, and 1 was continued. The loss of time was 83 days, or 9.22 days for each case. The Portsmouth reported the largest number, 3.

Dysuria.—A single case of this affection was noted, and it was invalided to hospital from the Tennessee.

Enuresis.—This affection was observed in 15 instances, or in the ratio of $3.18\frac{0}{0}$ as against $2.8\frac{0}{0}$ last year. Eleven returned to duty, 3 were invalided to hospital, and 1 from the service. The loss of service was 41 days. The cases occurred among the boys of the training-ships, 10 being reported from the New Hampshire.

Epididymitis.—One case, occurring on the Kearsarge, was noted, which was 7 days under treatment, and recovered.

Gonorrhœa.—The returns give 91 cases as having come under treatment, making a ratio of $19.30\frac{0}{0}$ as against $18.0\frac{0}{0}$ last year. The distribution of the cases was as follows: Seventy-six to duty, 14 to hospital, and 1 from the service. The daily average number of sick was $.52\frac{0}{0}$, the average duration of treatment 9.92 days, and the total loss of time was 903 days, rather less than last year. The principal sufferers were the Alliance, which returned 9 cases; New Hampshire, 7; Franklin, 8; and the Constellation, Tennessee, and Colorado, each 6.

Hæmaturia.—The Alarm reported 1 case of this trouble, which was immediately transferred to hospital.

Hydrocele.—There were 5 cases of hydrocele, yielding a ratio of $1.16\frac{0}{0}$ as against $.4\frac{0}{0}$ last year. Two were successfully treated on board, and 3 were sent to hospital. The loss of service was 61 days, the average duration of treatment having been 12.2 days. They occurred on various ships, the Alliance giving 2.

Nephritis.—Six cases of this disease were recorded, a ratio of $1.27\frac{0}{0}$ as against $.8\frac{0}{0}$ last year. Two were returned to duty, 3 were transferred to hospital, and 1 died. The average length of treatment was 25.16 days, and the total loss in time was 151 days. The Kearsarge reported 3 of the cases, and that which proved fatal occurred on the New Hampshire.

Orchitis.—The returns included 51 cases of this disease, making a ratio of $10.83\frac{0}{0}$, an increase over that of last year, which was $8.8\frac{0}{0}$. The recoveries were 36, and 13 were invalided to hospital. The daily average number of sick was $.27\frac{0}{0}$, and the average length of treatment was 9.21 days, so that the total loss of service amounted to 470 days.

It occurred most frequently on the training ships New Hampshire and Portsmouth.

Paraphymosis.—The Yantic reported 1 case of this trouble, which was relieved after 5 days of treatment.

Phymosis.—Five cases were returned, a ratio of $1.06\frac{0}{0}$ as against $.6\frac{0}{0}$ given last year. Three were treated on board, 1 was invalided to hospital, and 1 remained under treatment. The loss of service was 54 days.

Prostatitis.—The Alliance gave 1 case of this affection, which, after 5 days of treatment, was sent to hospital.

Urethra strictura.—Ten cases of urethral stricture came under observation, a ratio of $2.12\frac{0}{0}$, a small reduction from that of last year— $3.0\frac{0}{0}$. Four were treated on board and the remainder were sent to hospital. The loss in time amounted to 111 days. The Tennessee and Vandalia each gave 2 cases.

Varicocoele.—There were recorded 6 cases of this disease, a ratio of $1.27\frac{0}{0}$, all of which were satisfactorily treated on board. The loss in time was 21 days.

DISEASES OF THE LOCOMOTIVE SYSTEM.

Coming under this class there were included 22 cases of disease, giving a ratio of $4.61\frac{0}{0}$ as against $5.2\frac{0}{0}$ last year. The disposition of the cases was, 13 to duty, 7 to hospital, 1 from the service, and 1 continued. The number sick daily was $.18\frac{0}{0}$, the average duration 14.18 days, and the total loss of service was 312 days. The Constellation, New Hampshire, and Wabash were the principal sufferers from these affections as shown by the ratios, $27.39\frac{0}{0}$, $16.98\frac{0}{0}$, and $16.80\frac{0}{0}$ respectively.

DISEASES OF THE INTEGUMENTARY SYSTEM.

The aggregate of diseases falling under this class during the year was 483, making a ratio of $102.46\frac{0}{0}$. The ratio last year was almost exactly the same, or $102.2\frac{0}{0}$. Of this total, 428 were discharged to duty, 41 were invalided to hospital and from the service, while 13 were continued for treatment. The number sick daily was $2.60\frac{0}{0}$, the average duration was 9.29 days, and the total loss of time amounted to 4,488 days.

The distribution of these diseases among the vessels of the squadron is shown in the following table, together with the ratios for the three preceding years:

Ships.	1879.	1880.	1881.	1882.
Tallapoosa.....	56.00	40.00	121.21	168.80
Minnesota.....	119.76	93.75	122.07	155.10
New Hampshire.....	143.93	9.25	125.56	152.91
Portsmouth.....	158.33	162.79	122.80	147.54
Powhatan.....	81.81	101.17	96.85	143.42
Alliance.....		202.45	269.66	133.72
Saratoga.....	41.98	156.36	80.50	132.86
Bache.....	47.61	97.56	25.64	120.00
Jamestown.....				112.90
Michigan.....		50.00	147.30	109.89
Despatch.....		25.33	100.00	102.94
Enterprise.....				100.89
Colorado.....	68.76	42.42	53.04	95.58
Yantic.....		7.11	117.24	92.19
Franklin.....	66.33	13.15	57.89	70.27
Montauk.....				69.76
Wyoming.....			83.33	66.63
Tennessee.....	7.19	91.34	49.41	65.82
Constellation.....	45.89	62.03	130.94	54.79
St. Louis.....	40.40	80.45	49.70	40.98
Nantucket.....				38.48
Vandalia.....	153.48	27.90	17.54	35.89
Gedney.....		29.41	33.33	34.48
Wabash.....	35.04	15.15	42.42	33.61
Miantonomoh.....				30.30
Kearsarge.....	51.64	220.51	305.69	21.00

Abscessus.—There were recorded 125 cases, giving a ratio of $26.51\frac{0}{0}$, almost exactly the same as last year— $26.8\frac{0}{0}$. There were 111 recoveries on board; 10 were transferred to hospital and 4 were under treatment at the close of the year, and continued. The amount of time lost was 943 days, rather less than last year. The daily average sick numbered $.54\frac{0}{0}$, and the average duration of treatment, 7.54 days. The cases were most prevalent on the training ships, the Jamestown and New Hampshire each yielding 13 and the Saratoga 9.

Acne.—The Jamestown recorded 1 case of short duration.

Anthrax.—Four cases were noted, a ratio of $.84\frac{0}{0}$ against $.8\frac{0}{0}$ last year. Three recovered on board and the other was invalided to hospital. The loss of service was 30 days.

Cellulitis.—The returns included 5 cases of this trouble, a ratio of $1.06\frac{0}{0}$. Four were returned to duty and 1 transferred to hospital. The number of sick days amounted to 24.

Eczema.—There were reported 16 cases of eczema, a ratio of $3.39\frac{0}{0}$, as against $3.0\frac{0}{0}$ last year. Twelve were restored on board, 3 were transferred to hospital, and 1 remained. The loss of service was 119 days. The Kearsarge reported 5 of the cases, the largest number.

Erythema.—Three cases came under this head, 2 of which occurred on the New Hampshire. The ratio was $.63\frac{0}{0}$ as against $1.2\frac{0}{0}$ last year. All the cases recovered on board, giving a loss of 26 days of service.

Furunculus.—There were included 148 cases of this disease in the returns, all of which recovered on board, with 1 exception, and this was still under treatment. The ratio given was $31.39\frac{0}{0}$ as against $38.2\frac{0}{0}$ last year, and the daily rate of sick was $.49\frac{0}{0}$. The total number of sick days amounted to 851. The Saratoga reported 19 cases, the Powhatan 16, the Minnesota 15, the New Hampshire 12, and the remaining ships furnished a proportionate quota.

Herpes.—Three cases occurred on the Portsmouth, Jamestown, and Kearsarge, all of which recovered. The ratio was $.63$, against $1.2\frac{0}{0}$ last year.

Impetigo.—There were also 3 cases of this character, 2 of which returned to duty and 1 was invalided to hospital. The loss of service was 50 days.

Intertrigo.—The New Hampshire gave 1 case of this affection, which speedily recovered.

Lichen.—Two cases of this appeared, and recovered on board.

Onychia.—Nine cases were reported, mostly from the Colorado, Portsmouth, and New Hampshire. Seven were discharged to duty, 1 was sent to hospital, and 1 remained for treatment. The loss of service was 64 days.

Paronychia.—There were 51 cases of this disease returned, giving a ratio of $10.83\frac{0}{0}$ as against $6.4\frac{0}{0}$ last year. Of these, 49 were returned to duty, 1 was invalided to hospital, and 1 remained. The daily average sick was $.32\frac{0}{0}$, and the duration of treatment 11.05 days, while the total loss to the service in time was 564 days. They occurred in the following numbers: Minnesota 7, Portsmouth and Kearsarge 6 each, Colorado, New Hampshire, and Saratoga 4.

Pemphigus.—The Vandalia's returns included 1 case of this affection, which recovered after 12 days of treatment.

Pernio.—Nine cases were noted, all of which recovered, after an average of 13 days' treatment. The ratio furnished was $1.90\frac{0}{0}$ as against $1.6\frac{0}{0}$ last year.

Prurigo.—One case was recorded on the New Hampshire, and was invalided to hospital.

Psoriasis.—Four cases appeared on as many ships, 3 of which were discharged to duty and 1 transferred to hospital, the average duration having been 14 days. The ratio given was $.84\frac{0}{0}$ as against $.6\frac{0}{0}$ last year.

Scabies.—There were 13 cases of this eruption, making a ratio of $2.75\frac{0}{0}$ as against 2.6 last year, the number of cases being the same. They were all transferred to hospital for treatment, and all occurred on the training ships, 12 on the New Hampshire and 1 on the Saratoga.

Tinea.—The Powhatan afforded the single case of this character, which was 8 days under treatment.

Unguis involutis.—There were 5 cases of ingrowing nail, 4 of which were successfully treated on board, and 1 was continued. The ratio was $1.03\frac{0}{0}$, and the loss of service 44 days.

Ulcus.—The aggregate number of ulcers occurring in the squadron was 75, or $15.91\frac{0}{0}$ against $14.0\frac{0}{0}$ last year. The cases were disposed of as follows: 62 were returned to duty, 8 were sent to hospital, 1 was discharged from the service, and 4 remained. The daily rate of sick was $.85\frac{0}{0}$, the average duration of treatment 19.58 days, and the total loss of time 1,469 days. The largest number of cases occurred on the training ships, the Saratoga reporting 12, the New Hampshire 11, and the Portsmouth 4.

Urticaria.—Three cases were returned from the Colorado, Powhatan, and Minnesota, which recovered after an average period of 3.66 days. The ratio was .63, as against $3.4\frac{0}{0}$ last year.

DISEASES OF THE ABSORBENT SYSTEM.

Two diseases only were mentioned under this class, adenitis and lymphangitis, the former represented by 59 cases and the latter by 1, making 60 in all, with a ratio of $12.72\frac{0}{0}$, as against $11.8\frac{0}{0}$ last year. Of this number 40 were returned to duty, 17 were transferred to hospital, and 3 were continued. The ratio of sick daily was $.50\frac{0}{0}$, the average duration 14.36 days, and the loss of service amounted to 862 days. These affections appeared most frequently on the Kearsarge and Alliance, each of which gave 7 cases, and the Portsmouth and Tennessee each reporting 6.

NON-MALIGNANT TUMORS AND CYSTS.

This class furnished 12 cases, as against 3 last year, the respective ratios being $2.54\frac{0}{0}$ in 1882, and $.6\frac{0}{0}$ in 1881. Seven of the number recovered, 4 were sent to hospital, and 1 case of fibroma, occurring on the Michigan, terminated fatally. The number of sick days was 73, and the daily average number of sick was $.04\frac{0}{0}$. Three of the cases appeared on the Jamestown, and 2 on the Michigan.

POISONS.

There were 80 cases returned under this class, of which 76 resulted from the intemperate use of alcohol, 2 were cases of lead poisoning, and 2 were poisoned wounds. The ratio furnished was $16.96\frac{0}{0}$, rather less than that of last year, which was $18.2\frac{0}{0}$. Of the whole number 69 were discharged to duty, and 9 were invalided to hospital. The total loss of service amounted to 229 days, that from excessive use of alcohol was 212 days, the duration of the cases having been 2.86 days. The cases were recorded most numerous on the New Hampshire, with 11 cases, the Kearsarge and the Alliance each had 9, and the Wabash 7.

VIOLENT DISEASES AND DEATHS.

The aggregate of cases coming under this class was 737, giving a ratio of $156.34\frac{0}{0}$, not greatly differing from that of last year, which was $158.4\frac{0}{0}$. The disposition of these cases was as follows: To duty 649, to hospital 61, from the service 2, died 8, remaining 17. The ratio of the daily sick from this class was $3.56\frac{0}{0}$, the average duration of the cases was 8.33 days, and the total loss of service 6,142 days.

In the English squadron the ratios were: Admissions $\frac{0}{0}$, invaliding $\frac{0}{0}$, death $\frac{0}{0}$. In the German squadron the admission ratio was $130.7\frac{0}{0}$, and the average duration of treatment 15.9 days.

The ratios of these affections as they occurred in the various ships is exhibited in the following table, together with preceding years:

Ships.	1879.	1880.	1881.	1882.
Constellation	134.63	128.50	226.19	410.95
Alliance		335.54	325.84	302.52
Tallapoosa	192.00	240.00	373.73	288.00
Nantucket				269.23
Dale		120.07	235.29	243.90
Enterprise				240.56
Despatch		101.34	50.00	235.29
New Hampshire	234.84	129.62	184.34	220.87
Miantonomoh				212.12
Wyoming			150.00	200.00
Standish	25.15		111.11	200.00
Jamestown				197.58
Mayflower	82.98		58.82	181.81
Michigan	40.00	150.00	179.77	175.83
Minnesota	243.51	255.85	192.20	170.00
Bache	93.23	97.56	256.40	160.00
Kearsarge	103.29	256.41	217.67	140.00
Powhatan	278.78	238.09	115.18	139.44
Portsmouth	316.64	149.57	217.54	137.70
Passaic	16.16	17.85	37.03	135.59
Yantic		42.62	131.03	134.75
Colorado	120.34	56.06	74.88	132.31
Wabash	85.76	70.70	66.66	126.05
Tennessee	19.17	158.56	101.17	118.89
Vandalia	204.65	125.58	87.71	107.63
Gedney	60.27	117.64	166.66	103.44
Franklin	107.14	65.78	115.78	102.69
Ajax	185.18	66.66	31.25	83.33
St. Louis	191.91	68.96	168.31	81.96
Montauk				69.76
Alarm	250.00	160.60	54.05	50.00
Saratoga	152.67	76.36	165.25	45.45
Wyandotte				14.70

Abrasio.—There were 26 cases of abrasion returned, a ratio of $5.51\frac{0}{0}$ as against $13.16\frac{0}{0}$ last year. All were returned to duty, after an average treatment of 9.5 days, making the total loss equal to 247 days. The Jamestown, Tallapoosa, Portsmouth, and Enterprise suffered equally, reporting 3 cases each.

Ambustio.—The number of cases was 45, and the ratio 9.52, as against $8.6\frac{0}{0}$ last year. The number transferred to hospital was 3, and the remaining 41 were returned to duty. The loss of time was 356, making the average length of treatment 7.91 days. They occurred chiefly on the Portsmouth (6), Minnesota (5), Tennessee (5), and New Hampshire (5).

Concussio cerebri.—This injury furnished the large number of 13 cases, making a ratio of $2.75\frac{0}{0}$, as against $.6\frac{0}{0}$ last year. Three of the number were transferred to hospital, 2 died, and the remaining 8 were discharged to duty. The average duration of treatment was 9.07 days, and the total loss of service 118 days. Three cases occurred on the New Hampshire, 2 on the Enterprise (1 of which died), 1 on the Portsmouth, which was fatal, and 2 on the Franklin.

Concussio spinalis.—The single case of this injury occurred on the Tennessee, was under treatment for 62 days, and finally recovered.

Congelatio.—There were 10 cases of frost bite, giving a ratio of $212\frac{0}{100}$, as against $2.2\frac{0}{100}$ in 1881. Eight of these were discharged to duty, and 2 to hospital. The loss of service was 38 days, making an average of 3.80 days for each man. Two cases occurred on the New Hampshire, Portsmouth, Tennessee, and Powhatan, respectively.

Contusio.—There were reported 194 cases of contusion, the largest factor of the class, giving a ratio of $41.15\frac{0}{100}$, as against $45.8\frac{0}{100}$ last year. The number of those who were returned to duty was 184; 8 were discharged to hospital and 2 were continued. The average ratio of the sick daily was .67. The average duration of treatment was 5.98 days, and the total loss of service 1,161 days. They occurred in greatest numbers on the alliance (27), Jamestown (20), Tennessee (18), and Enterprise (14).

Fractura.—There were 32 cases of this injury, making a ratio of $6.78\frac{0}{100}$, as against $5.0\frac{0}{100}$ last year. The number returned to duty was 19, and 13 were invalided to hospital. The average duration of treatment was 18.5 days, making a total loss of service of 592 days. The daily average ratio of the sick was $.34\frac{0}{100}$. The Powhatan reported the largest number of cases—5 and 3 occurred on the Tennessee and Colorado, respectively.

Luxatio.—The returns included 14 cases of this form of injury, a ratio of $2.96\frac{0}{100}$, as against $2.6\frac{0}{100}$ last year. Of these 10 were discharged to duty, 3 were invalided to hospital, and 1 from the service. The daily ratio of sick was $.05\frac{0}{100}$, the average duration of treatment 7.28 days, and the total loss of time 102 days. The Kearsarge reported the greatest number of cases, 4, and the Enterprise gave 3.

Stremma.—There were reported 156 cases of sprain, giving a ratio of $33.09\frac{0}{100}$, as against $32.0\frac{0}{100}$ last year. Of this number 129 were discharged to duty, 18 to hospital, and 9 remained under treatment. The daily ratio of sick was $.69\frac{0}{100}$; the average period of treatment was 7.61 days, making the total loss of service 1,198 days. The cases were very generally distributed among the various ships, the New Hampshire and Alliance contributing the largest numbers, 13 and 12 respectively.

Submersio.—The New Hampshire, Tennessee, Tallapoosa, and Michigan each reported a death by drowning, the ratio being $.84\frac{0}{100}$, as against $.6\frac{0}{100}$ last year.

Suicidium.—As was the case last year, a single case of this occurred, which was reported from the New Hampshire.

Vulnus contusum.—Of contused wounds there were returned 97 cases, in the ratio of $20.59\frac{0}{100}$, as against $21.6\frac{0}{100}$ last year. The number restored to duty was 91, 3 were transferred to hospital, and 1 from the service, while 2 remained under treatment. The daily rate of sick was $.57\frac{0}{100}$, the average duration of treatment 10.17 days, and the total loss of service 987 days. The New Hampshire was by far the largest sufferer, contributing 27 cases, and 8 occurred on the Tallapoosa, 7 on the Alliance, and 5 on the Tennessee, Jamestown, Vandalia, and Dale, respectively.

Vulnus incisum.—The incised wounds numbered 61 cases, equaling a ratio of $12.95\frac{0}{100}$, considerably less than that of last year, which was $21.6\frac{0}{100}$. The disposition of the cases was, 57 discharged to duty, 2 to hospital, 1 died, and 1 remained on the list. The daily sick rate was $9.26\frac{0}{100}$, and the total number of sick days 560, making the average duration of the cases 9.26 days. These injuries occurred in greatest frequency on the New Hampshire, 11 cases; the Tennessee gave 6, and the Portsmouth and Minnesota 5 each.

Vulnus laceratum.—The aggregate number of lacerated wounds was 56, yielding a ratio of $11.88\frac{0}{0}$, as against $8.8\frac{0}{0}$ in 1881; fifty of these were returned to duty, 4 were transferred to hospital, and 2 remained. The daily ratio of sick was $.33\frac{0}{0}$, and the loss of service 570 days, or 10.17 days for each case. As in the other variety of wounds, the New Hampshire returned the largest number, which was 9, and the Tennessee and Powhatan each gave 5.

Vulnus punctum.—These injuries numbered 23, making a ratio of $4.87\frac{0}{0}$, as against $5.8\frac{0}{0}$ in the previous year. All recovered on board after an average duration of 5.04 days, making the total loss 116 days; six of these cases occurred on the New Hampshire and 3 on the Minnesota and Tallapoosa, respectively.

Vulnus sclopetarium.—There were 4 cases of gunshot wounds, occurring on the Tennessee, Kearsarge, Wyoming, and Wyandotte. Two were returned to duty and 2 transferred to hospital. The loss of service was 25 days, or 6.25 days for each case.

NAVAL HYGIENE.

AJAX.

This iron-clad, with a complement of 30 men, continued at City Point, James River, during the entire year. In this malarious climate she suffered largely from the zymotic affections, and reported a ratio of $138.88\frac{0}{00}$, with an average duration of 3.4 days of treatment. In the constitutional class there were 3 cases, a ratio of $83.33\frac{0}{00}$, the average number of sick daily was $1.94\frac{0}{00}$, and the average duration of treatment 9 days. The diseases of the digestive system were 5 in number, or $133.88\frac{0}{00}$, with a loss of 11 days. The genito-urinary organs yielded 4 cases, the ratio being $111.11\frac{0}{00}$, with a loss of only 6 days.

There were but 3 cases of injury, or $83.53\frac{0}{00}$.

ALARM.

This iron torpedo-boat was in commission during the two first quarters of the year, at Washington, D. C., and at Norfolk during the third quarter, where she went out of commission. The zymotic class of diseases furnished 10 cases, a ratio of $250.0\frac{0}{00}$, with a loss of 28 days service, and a daily ratio of $2.50\frac{0}{00}$. In the constitutional class there were but 2 cases, or $50.0\frac{0}{00}$, and in diseases of the nervous system the same number and ratio occurred. The respiratory system contained 3 cases, a ratio of $75\frac{0}{00}$, with a daily sick rate of $1.33\frac{0}{00}$. Four cases were recorded of maladies of the digestive system, which fixed a ratio of $100.0\frac{0}{00}$ and the daily ratio of sick was $1.75\frac{0}{00}$. In the genito-urinary class, precisely the same figures are presented. But 2 cases occurred of injuries, or $50.0\frac{0}{00}$, with the loss of 10 days of service.

ALLIANCE.

This vessel spent the first month of the year in Boston, whence she sailed to Norfolk, remaining 9 days, and from thence to the West Indies, where she arrived towards the close of the first quarter. In the second quarter she visited Kingston, Jamaica, Aspinwall, and Vera Cruz, returning to Hampton Roads, where she remained one month. The third quarter was spent on the coast of New England, and she returned during the fourth quarter to New York, Philadelphia, and Hampton Roads. During the year she was at sea 124 days and in port 241 days.

In this vessel the number of cases of zymotic origin was 14, giving a ratio of $81.39\frac{0}{00}$; mostly from febricula and intermittent fever, of which there were 6 cases. The loss of service was 69 days, or 4.92 days for each case, and the daily average sick rate was $2.34\frac{0}{00}$. The class of constitutional diseases yielded 38 cases, a ratio of $226.74\frac{0}{00}$, a daily ratio of $6.51\frac{0}{00}$, and causing a loss of 411 days' service. The cases were chiefly rheumatic, of which there were 29 cases, and there were 6 of syphilis. In the class of diseases of the nervous system there were 30 cases, making a ratio of $114.44\frac{0}{00}$. The daily sick rate was $1.33\frac{0}{00}$, and the loss of time, 84 days. Cephalalgia was the chief factor, giving 17 cases, and

there were 8 of nausea marina. One case of dementia was invalided. In the class of diseases of the eye there were 5 cases of conjunctivitis, giving a ratio of $29.07\frac{0}{0}$. The loss of service was 22 days, and the daily ratio of sick $.25\frac{0}{0}$. The number of cases in the class of diseases of the respiratory organs was 25, a ratio of $145.34\frac{0}{0}$. Five were invalided, or $29.07\frac{0}{0}$. The loss of service was 128 days, and the daily sick rate was $2.03\frac{0}{0}$. The chief affections were catarrhus, of which there were 16 cases; and laryngitis and acute bronchitis, each of which yielded 2. Two cases of phthisis and 1 of catarrhus were invalided. Diseases of the digestive system included 30 cases, the ratio being $138.46\frac{0}{0}$. The loss of time resulting was 135 days, or 5 days for each case, and the daily average sick rate was $1.84\frac{0}{0}$. Two cases were invalided. In the genito-urinary class 25 cases appear, making a ratio of $145.34\frac{0}{0}$, and a daily sick rate of $4.41\frac{0}{0}$. The total loss of time was 281 days, or 11.24 days for each case. One case each of prostatitis and nephritis were invalided. Integumentary diseases were 23 in number, or $133.72\frac{0}{0}$, as against $269.66\frac{0}{0}$ last year. They were almost entirely abscess and furunculus. The loss of service was 139 days, or 6.04 days for each case. Diseases from violence included 52 cases, a ratio of $302.32\frac{0}{0}$, as against $325.84\frac{0}{0}$ in 1881. The loss of service was 353 days, and the average daily ratio of sick from these cases was $5.58\frac{0}{0}$. None were invalided.

BACHE.

This vessel is employed on Coast-Survey duty, and was engaged during the early part of the year in the vicinity of New York, and later on the coast of Florida. Of the zymotic affections she reported 4 cases, all of intermittent fever, making a ratio of $160\frac{0}{0}$, and a daily ratio of $2.40\frac{0}{0}$. One of these was invalided to hospital. Only one case appeared among the constitutional affections, which was of chronic rheumatism. The digestive system contributed 5 cases, a ratio of $200.0\frac{0}{0}$ against $179.48\frac{0}{0}$ last year, and the daily ratio was $1.20\frac{0}{0}$. All recovered. Diseases from violence numbered 4, a ratio of $160.0\frac{0}{0}$ as against $256.40\frac{0}{0}$ last year. Two were invalided, or $80\frac{0}{0}$. The daily average sick rate was $9.6\frac{0}{0}$.

CATSKILL.

This iron-clad lay, during the entire year, at City Point, James River, in ordinary, with a complement of thirty men. She suffered more from zymotic diseases than last year, reporting 8 cases, mostly of intermittent fever, the ratio being the large one of $666.66\frac{0}{0}$, and the daily sick rate $6.0\frac{0}{0}$. The loss of service was 36 days. The ratio of diseases of the genito-urinary system was $153.84\frac{0}{0}$, and the loss of service 18 days, resulting from 2 cases of gonorrhœa.

COLORADO.

This vessel continued to be employed as the receiving ship at the Brooklyn navy-yard, with an average ship's company of 272 men. In the class of zymotic diseases there were reported 17 cases, with a ratio of $62.5\frac{0}{0}$, as against $35.86\frac{0}{0}$ last year. These included 2 cases of erysipelas, and 12 of intermittent fever, 3 of which were invalided. The invaliding rate was $18.38\frac{0}{0}$, and the daily average number of sick was .51. The loss of service amounted to 52 days. The constitutional affections gave 34 cases, with a ratio of $125\frac{0}{0}$, as against $76.76\frac{0}{0}$ last year. The loss of service amounted to 99 days, or 2.91 days for each case. Twenty-three cases were invalided, and the ratio was $84.55\frac{0}{0}$.

Nineteen cases were rheumatic, 9 syphilitic, and 5 were of adynamia. The cases of diseases of the nervous system numbered 15, a ratio of $55.14\frac{0}{0}$, as against $10.93\frac{0}{0}$ in 1881. The loss of service was 35 days, and the daily average number of sick was $.33\frac{0}{0}$. The average duration of treatment was 2.33 days. Two cases, or $22.05\frac{0}{0}$ were invalided. The cases were chiefly neuralgia, 10; and epilepsia, 2. The cases coming under the respiratory class of diseases were chiefly catarrhus, 7; and laryngitis, 2; and 1 of pneumonia. The ratio was $36.76\frac{0}{0}$, as against $48.36\frac{0}{0}$ in 1881, and the average number of sick daily was $.33\frac{0}{0}$. The number of sick days was 34, making the average duration 3.4 days. Diseases of the digestive system gave 32 cases, a ratio of $117.69\frac{0}{0}$, as against $51.48\frac{0}{0}$ last year. The loss of time was 92 days, or 2.87 for each man, and the average number sick daily was $.83\frac{0}{0}$. The cases were chiefly diarrhœa acuta, vermes, and tonsillitis. The class of diseases of the genito-urinary system gave 13 cases, a ratio of $47.79\frac{0}{0}$, and yielding a daily sick rate of $.51\frac{0}{0}$. The total loss of service from these diseases was 35 days, an average of 2.69 for each case. The ruling affections were gonorrhœa, 6 cases; and its sequelæ, orchitis and strictura urethræ. Of integumentary diseases there were 26 cases, a ratio of $98.58\frac{0}{0}$, as against $53.04\frac{0}{0}$ last year, and the daily ratio was $1.61\frac{0}{0}$. The invaliding ratio was $18.38\frac{0}{0}$, against $7.80\frac{0}{0}$ in the previous year. The principal factors were abscessus, onychia, and paronychia, of each of which there were 3 cases. Injuries contributed 35 cases, a ratio of $132.31\frac{0}{0}$, considerably larger than that of last year, when it was $74.88\frac{0}{0}$. Eleven cases, or $11.44\frac{0}{0}$, were invalided to hospital. The daily average ratio of sick was $1.28\frac{0}{0}$, the total loss of service 128 days, and the average duration of treatment 3.27 days. The chief factors were stremma, 12 cases; contusio, 8; and there were 9 cases of the various kinds of wounds.

CONSTELLATION.

This vessel served as a practice ship for naval cadets during the summer cruise, and was at sea 40 days exercising in the Chesapeake Bay, and along the coast of the New England States. She reported, in the zymotic class of diseases, 16 cases, a ratio of $219.17\frac{0}{0}$, nearly the same as that of last year, which was $214.08\frac{0}{0}$. Two of these, $27.39\frac{0}{0}$, were invalided to hospital. The ratio of the average daily sick was $12.87\frac{0}{0}$, the duration of treatment 5.43 days, and the total number of sick days 87. The cases were 7 intermittent fever and 1 remittent, and 2 each of febricula, rötheln, and vaccina. In the constitutional affections, but 1 case of acute rheumatism occurred, which was only 3 days under treatment. There were 26 cases of nervous affections, giving the large ratio of $356.16\frac{0}{0}$, against $47.61\frac{0}{0}$ last year, comprising nausea marina 12, neuralgia 5, and cephalalgia 8. The loss of time was 77 days, and the average daily sick rate $11.36\frac{0}{0}$. The diseases of the digestive system reached the large number of 48 cases and a ratio of $657.55\frac{0}{0}$; last year it was but $202.18\frac{0}{0}$. The cases were chiefly of diarrhœa, acute and chronic, and there were two of hæmatemesis. Two cases, $27.39\frac{0}{0}$, were invalided to hospital. The number of sick days were 160, and the daily average sick rate was $15.47\frac{0}{0}$. Diseases of the genito-urinary organs gave 7 cases, 6 of gonorrhœa and 1 of chancroides, the former being invalided to hospital. The ratio of admissions was $95.89\frac{0}{0}$, and of invaliding $82.19\frac{0}{0}$. The daily sick rate was $14.24\frac{0}{0}$, and the loss of 96 days gave an average duration of 13.71 days. There were 4 cases of integumentary diseases, 3 of furunculus, and 1 of abscess, a ratio of $54.79\frac{0}{0}$, as against $130.94\frac{0}{0}$ last year. The daily average sick rate was $2.05\frac{0}{0}$.

Diseases resulting from violence numbered 30, giving a ratio of $410.95\frac{0}{0}$, showing a very large increase over last year, when it was $226.19\frac{0}{0}$. The daily average rate was $35.19\frac{0}{0}$, and the loss of service was 237 days, or 7.9 for each case. Three cases, a ratio of $41.09\frac{0}{0}$, were invalided.

CATSKILL.

This vessel is one of the iron-clads lying in ordinary at City Point, James River, her force being 15 men. Fourteen cases of sickness gave a ratio of $933.33\frac{0}{0}$, 10 of which were of the zymotic class, the ratio here being $666.66\frac{0}{0}$. Of these, 8 were of intermittent fever, and 2 vaccina. The class of genito-urinary affections gave 2 cases, or $133.33\frac{0}{0}$, both of gonorrhœa, the loss of service being 18 days.

DALE.

This vessel was employed during the summer months as a practice ship for naval cadets, and was engaged in cruising along the coast of Massachusetts, and in the Chesapeake Bay. Her service was 47 days at sea and 46 in port. She was comparatively free from zymotic diseases, but 3 cases being reported, or $73.17\frac{0}{0}$, as against $55.82\frac{0}{0}$ last year. The number of sick days was 11. Two were intermittent fever and 1 febricula. Constitutional affections gave the same number of cases and ratio, 2 being rheumatismus chronicus and 1 syphilis consecutiva. One of the former was invalided. The loss of service was 17 days, and the daily average sick-rate $4.63\frac{0}{0}$. Of nervous affections there were 15 cases, all of which were of nausea marina, this unusual number resulting from the first experiences of a class of cadets at sea. The ratio of admissions was $365.85\frac{0}{0}$, and the loss of service 35 days, or 2.33 days for each case. But 1 case of respiratory disease occurred, a ratio of 24.39. The diseases of the digestive system were 18 in number, mostly of acute diarrhœa (13 cases). The ratio of admissions was $439.02\frac{0}{0}$, that of last year having been $262.70\frac{0}{0}$. The loss of service was 76 days, or 4.22 days per man. The daily sick rate was $19.71\frac{0}{0}$. The only disease of the genito-urinary organs which appeared was orchitis, of which there was 1 case. Ten cases of diseases from injuries were recorded, giving a ratio of $243.90\frac{0}{0}$, nearly the same as last year, when it was $235.29\frac{0}{0}$. The invaliding ratio was $26.39\frac{0}{0}$. The time lost was 105 days, an average of 10.50 per case, and the average rate of sick per day was $27.31\frac{0}{0}$. One half the cases were of vulnus contusum.

DESPATCH.

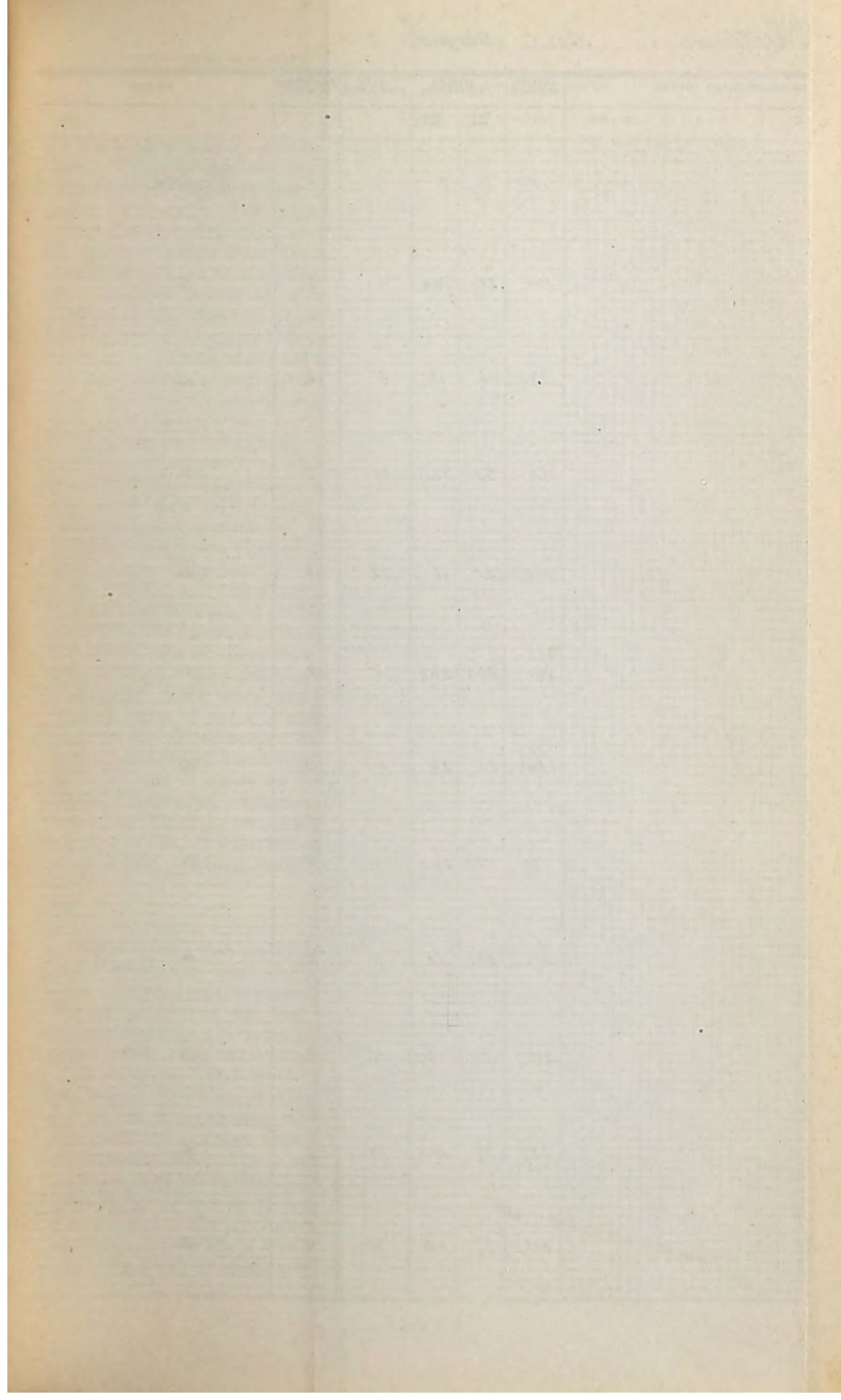
This vessel was at Samana Bay during the first quarter of the year, returning during the second quarter to Washington. The third and fourth quarters were spent at Washington and Norfolk, and in cruising along the New England coast. The considerable service of this ship at Samana in the early part of the year resulted in the large ratio of admissions for zymotic affections of $323.52\frac{0}{0}$, given by 19 cases of intermittent fever and 3 of remittent. One of the former was invalided, or $14.70\frac{0}{0}$. The loss of service was 141 days. The ratio of admissions for constitutional affections was $44.11\frac{0}{0}$, as against $16.66\frac{0}{0}$ last year, and the cases were mostly of a syphilitic character. The loss of service was 86 days and the average daily ratio was $3.38\frac{0}{0}$. Nervous affections contributed 2 cases, both of nausea marina, giving a ratio of $24.41\frac{0}{0}$. The loss of service was only 2 days. Five cases of diseases of the di-

gestive organs were reported, of which two were tonsillitis. The ratio given was $73.52\frac{0}{00}$, and the daily sick rate $44\frac{0}{00}$. The loss of service was 14 days, and 1 case, or $14.70\frac{0}{00}$ was invalided. The genito-urinary system gave 4 cases, all of which were invalided, the ratio being $58.82\frac{0}{00}$. The cases were albuminuria, chancroides, gonorrhœa, and orchitis. The loss of service was 6 days. Integumentary diseases were 7 in number, 3 each of abscessus and erythema, and 1 of unguis involutis. The ratio of admissions was $102.94\frac{0}{00}$, the loss of service was 52 days, and the daily average sick rate was $2.05\frac{0}{00}$. The injuries included 1 case of contusio, 9 of stremma, and 6 of wounds, 16 in all, giving a ratio of $235.29\frac{0}{00}$, as against $50\frac{0}{00}$ last year, and showing a very large increase. The daily ratio of sick was $4.70\frac{0}{00}$, and the total loss of time 118 days. Two cases, a ratio of $29.41\frac{0}{00}$, were invalided to hospital.

ENTERPRISE.

This vessel spent the first quarter at Washington and Norfolk, sailing thence in February for the Windward Islands, of the West Indies, and returning via Kingston, Jamaica, Curaçoa, and Key West. She returned to New York in the third quarter, and the remainder of the year was occupied in cruising along the coast of the New England States, whence she returned to Hampton Roads, where she remained during the last six weeks of the year. She was at sea 102 days and in port 263 days. Zymotic diseases were represented on this ship by 35 cases, 20 of which were intermittent fever, 6 febricula and simple continued fever, and 8 vaccina. The ratio of admissions was $195.53\frac{0}{00}$, and of the invalided to hospital $116.75\frac{0}{00}$. The daily ratio of sick was $2.34\frac{0}{00}$, and the loss of service 152 days, or 434 for each case. The constitutional affections contributed 23 cases, of which 6 were syphilis, 9 rheumatism, 5 lumbago, and 3 adynamia. The ratio of admissions was $128.49\frac{0}{00}$, and that of the invaliding $39.44\frac{0}{00}$. The daily sick rate was $2.48\frac{0}{00}$, and the loss of service 128 days. The cases of nervous affections were 30 in number, a ratio of $167.59\frac{0}{00}$. The principal factors were neuralgia 9, nausea marina 8, and cephalalgia 6. Six cases, a ratio of $38.50\frac{0}{00}$ were invalided to hospital. The daily sick rate was 1.95, the loss of service 124 days, and the average duration 4.13 days.

There were reported 37 cases of diseases of the respiratory organs, a ratio of $207.04\frac{0}{00}$, mostly of bronchitis (23) and catarrhus (12). The invaliding ratio was $50.61\frac{0}{00}$, and the daily sick rate was $5.09\frac{0}{00}$. The loss of service was 319 days or 8.62 days for each case. The diseases of the digestive system afforded 42 cases, of which diarrhœa acuta (18), dyspepsia (8), and pharyngitis (6) furnished the largest contingent. The ratio was $234.97\frac{0}{00}$, and that for invaliding was $33.86\frac{0}{00}$. The loss of service was 223 days, and the average duration of treatment 5.30 days. The average daily ratio of sick amounted to $3.45\frac{0}{00}$. The genito-urinary class of diseases furnished 11 cases of disease, a ratio of $61.44\frac{0}{00}$, and causing a loss of 96 days. The daily average ratio of sick was $1.50\frac{0}{00}$, and the average duration of treatment 9.37 days. The invaliding rate was $22.34\frac{0}{00}$. The principal factor was orchitis, which gave 4 cases. The integumentary diseases amounted to 18, and the ratio of admissions to $100.89\frac{0}{00}$. The number of sick days was 125, and the average number sick daily $1.95\frac{0}{00}$. The duration of treatment was 6.94 days. The injuries were 43 in number, and the ratio $240.56\frac{0}{00}$; the resulting loss of service amounted to 323 days. There was a daily average of $5.08\frac{0}{00}$, and the average duration of treatment was 5.42 days. Two cases, or $11.17\frac{0}{00}$, were invalided, and there was 1 death from *concussio cerebri*.



U. S. S. Franklin

J. D. Gatewood

Asst., Surgeon.*

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											134	17	7	13	1	Norfolk
February											134	21	10.6	4	2	do.
March											134	18	10	9	2	do.
April											160	20	14.6	11	0	do.
May											142	20	18	12	1	do.
June											140	23.6	24.6	5	1	do.
July											186	25	26	4	2	do.
August											170	25.3	25.3	10	2	do.
September											315	22	22	9	2	do.
October											202	20	19.3	13	3	do.
November											237	19	10.3	4	1	do.
December											318	17	6.6	5	0	do.

* D. M. Murtaie, Surgeon, from April

FRANKLIN.

This ship was in service during the year as the receiving ship at Norfolk, Va., and reported 53 cases of zymotic diseases, of which 32 were febris intermittens, 16 were febris remittens, and 1 each parotitis and roseola. The ratio of admission was $286.48\frac{0}{0}$, as against $236.84\frac{0}{0}$ last year. The number of sick days was 206, the daily average number of sick $3.12\frac{0}{0}$, and the average duration of treatment 3.88 days. Five cases, or $27.02\frac{0}{0}$ were invalided to hospital. The constitutional cases on this ship were 7 in number, nearly all of rheumatism; there were none of syphilis. The ratio contributed was $37.84\frac{0}{0}$, the number of sick days 54, the number sick daily was $.75\frac{0}{0}$, and the average period of treatment 7.71 days. Three cases, or $16.21\frac{0}{0}$ were invalided to hospital. Diseases of the nervous system gave the same number of admissions and ratio as in the last class, and included 6 cases of neuralgia and 1 of vertigo. The loss of service was 28 days, the daily number of sick $.37\frac{0}{0}$, and the length of treatment 4 days. One case was invalided. This ship reported 13 cases of diseases of the respiratory organs, of which 1 was asthma, 23 bronchitis, 12 catarrhus, and 1 phthisis chronica. The loss of time was 79 days, the daily average ratio of sick $1.13\frac{0}{0}$, and the average period of treatment 6.07 days. Three cases, a ratio of $16.21\frac{0}{0}$, were invalided. The diseases of the digestive system yielded 18 cases, a ratio of $97.29\frac{0}{0}$, as against $178.94\frac{0}{0}$ last year. The loss of service was 71 days, the daily average rate of sick $1.02\frac{0}{0}$, and the average period of treatment 3.94 days. The invalided were 3 cases, or $16.21\frac{0}{0}$. The diseases of the genito-urinary system afforded 18 cases, a ratio of $97.29\frac{0}{0}$, as against $136.84\frac{0}{0}$ last year. The number of sick days was 182, over the average duration of treatment 10.11 days. The daily average ratio of sick was $2.64\frac{0}{0}$, and the invaliding rates were $51.61\frac{0}{0}$ to hospital, and $5.40\frac{0}{0}$ from the service. There were 13 cases of skin disease, a ratio of $70.27\frac{0}{0}$, as against $57.89\frac{0}{0}$ last year. The number of days lost to the service was 130 and the average duration of treatment 10 days. There was a daily ratio of sick of $1.89\frac{0}{0}$, and 3 cases or $10.81\frac{0}{0}$, were invalided. Nearly all the cases were of abscess. Diseases resulting from injuries were 19 in number, a ratio of $102.69\frac{0}{0}$, as against $115.78\frac{0}{0}$ last year. The number of days lost was 126, or 6.63 for each case, and the daily average ratio of sick was $1.83\frac{0}{0}$. The invaliding ratio was $10.81\frac{0}{0}$.

GEDNEY.

This vessel was employed during the first half of the year in survey duty along the coast of Florida and South Carolina. Subsequently, she was engaged on the same duty in Long Island Sound, and she spent the latter portion of the year repairing in New York. In the class of zymotic diseases she reported 3 cases of malarious fever, 2 of which were invalided. The ratio of admissions was $103.44\frac{0}{0}$, and the loss of service was 25 days. The ratio of sick daily was $2.06\frac{0}{0}$, and for the invalided $68.96\frac{0}{0}$. The constitutional affections numbered 4, a ratio of $137.93\frac{0}{0}$, of which 2, or $68.96\frac{0}{0}$, were invalided. The number of sick days was 49, and the average ratio of sick daily $4.47\frac{0}{0}$. The cases were chiefly of rheumatism. There were reported 3 cases of diseases of the digestive system, 1 of acute diarrhœa, and 29 of acute dysentery, making a ratio of $103.44\frac{0}{0}$. The loss of service was 32 days, and the daily average number of sick $2.75\frac{0}{0}$. Injuries contributed 3 cases, a ratio of $103.44\frac{0}{0}$, of which 1, or $34.48\frac{0}{0}$, was invalided. The loss of service was 52 days, and the daily average sick rate $4.82\frac{0}{0}$.

JAMESTOWN.

This ship went into commission in February at the Mare Island navy-yard, and sailed a month later for Newport, R. I., via Cape Horn. She was 113 days in making the passage, and after remaining a month at Newport she spent the remainder of the year in cruising, as a school ship for apprentices, along the coast. During the year she was in port 156 days and at sea 164. The zymotic affections comprised only 7 cases of malarial fever, giving a ratio of $28.22\frac{0}{00}$. The loss of service was but 12 days, and all the cases speedily recovered on board.

The number of constitutional affections was 34, a ratio of $137.09\frac{0}{00}$, the chief factors being chronic and acute rheumatism. The loss of service was 294 days, and the daily average number of sick $3.22\frac{0}{00}$. Five cases of rheumatism and 1 of syphilis were invalided, making a ratio of $24.19\frac{0}{00}$. There were reported 28 cases of nervous affections, making a ratio of $112.90\frac{0}{00}$, of which 1, or $4.03\frac{0}{00}$, was invalided to hospital. The loss of time was 283 days, and the daily average ratio of sick $2.78\frac{0}{00}$. The cases comprised 12 of nausea marina, 10 of neuralgia, and 5 of cephalalgia. From this ship were reported 68 cases of diseases of the respiratory system, a ratio of $274.19\frac{0}{00}$, and causing a loss of 426 days of service. The daily average ratio of sick was $4.67\frac{0}{00}$, and the average duration of treatment 6.26 days. The cases were mostly bronchitic and catarrhal, besides 1 each of pleuritis and pneumonia, both of which were invalided. The invaliding ratio was $68.54\frac{0}{00}$. There are classed under the head of diseases of the digestive system 38 cases, or $153.51\frac{0}{00}$, inflicting a loss of 256 days' service. The daily average ratio of sick was $2.82\frac{0}{00}$, and the average duration of treatment 6.73 days. Five cases, a ratio of $20.15\frac{0}{00}$, were invalided to hospital. Diseases of the genito-urinary organs contribute 6 cases, a ratio of $24.19\frac{0}{00}$, and a loss in time of 58 days. The daily average ratio of sick was $.60\frac{0}{00}$, and the average duration of treatment 9.66 days. Of the integumentary diseases there were 28 cases or $112.90\frac{0}{00}$, all of which recovered, the loss of time amounting to 218 days. The daily average sick rate was $2.37\frac{0}{00}$, and the average duration of treatment 7.78 days. The principal factors were furunculus, abscessus, and paronychia. There resulted from injuries 49 cases of disease, a ratio of $197.58\frac{0}{00}$, of which 1 case of fracture, or $4.03\frac{0}{00}$, was invalided to hospital. The loss of service was 317 days, making the average period of treatment 6.46 days. The average daily sick rate was $3.39\frac{0}{00}$. In regard to the sanitary condition of the ship, Surgeon B. S. Mackie makes the following report:

From a hygienic point of view, little can be said in favor of the Jamestown, for she was built in the days when little was known of the advantages of pure air and good ventilation. She has a gun-deck, however, which is certainly a great advantage to a ship. This contains about 24,500 cubic feet of air space, and, with its numerous ports and hatchways, leaves little to be desired in the way of fresh air, although much sickness has lately been occasioned by drafts of cold winter air, pouring in at night through the open hatchways, upon those who slept near them.

The berth-deck contains about 14,800 cubic feet of air space, and at sea may be said to have very little ventilation. This, of course, varies at different times, according to the force and direction of the wind, as well as whether the hatches are open or closed. The total number of billets on this deck is eighty-two, giving each individual about 168 cubic feet of air space, with little chance of his getting a renewal of fresh air often enough to maintain health. If it were not for the fact that many of those who sleep upon this deck, stand watch at night at sea, and are consequently only four hours at a time in their reeking and imperfectly ventilated sleeping quarters, no doubt much more serious trouble would result.

The bilges of the ship have been, up to within about a week, almost entirely inaccessible, and as filthy as they well could be. It was impossible to get at them, owing to their construction and the stowage of water-tanks over them, although they were

known to be in bad condition, until the ship was sent to a navy-yard, where everything could be taken out of her hold. This was done recently, and they were thoroughly cleaned out, and all the spaces between the timbers filled in with Portland cement and brick, making a floor, upon which it is hoped filth will not accumulate, but still it will not be possible to inspect this surface, as it is as inaccessible as before.

The ward-room and the pantry, which opens into it, together contain 6,639 cubic feet of air space, which gives each one of the eight officers sleeping there about 829 cubic feet, and, as the hatchway is left open at night, the ventilation has usually been good. In some of the rooms as many as four bilge ventilators were found, and sometimes at the head of the bunk, as if placed there for the purpose of giving the occupant the full benefit of the foul emanations from the bilges. In this connection, it may be mentioned that a great many of these bilge ventilators were found on the berth-deck, so that it seemed as if the constructors of the ship had considered the bilges the only parts of the ship worthy of ventilation. These openings have all been closed, and now the bilges have to ventilate themselves as best they can, and pour out their noxious gases wherever they can find an unguarded opening.

The steerages are two in number, one containing four bunks and the other having a transom. The cubic air space in the one containing the four bunks amounts to 640 feet, giving each sleeper about 160 cubic feet. These apartments on board of many men-of-war cannot be too severely condemned on account of the discomforts to which their occupants are subjected, and it is to be hoped that the representations which have been made of the objectionable features of these quarters will be considered in the construction of the new ships. It is perhaps not too much to say that many a young officer of studious inclination and ambitious of attaining excellence in his profession has been compelled to give up his aspirations from want of a place where he could find the quiet and privacy so necessary to the student.

The clothing of the apprentices on this ship is excellent. The shirts worn are of the regulation pattern, but are objectionable on account of leaving the entire neck and upper portion of the chest exposed.

The system adopted on board this ship for dieting the boys seems to answer well, and is, no doubt, better than any other in use in the service. All the boys' messes are under the care of an officer and a schoolmaster, who, by means of the money derived from commuted and stopped rations, are enabled to supply them with many kinds of fresh food not in the ration allowance, thus giving them greater variety. So well has this department been managed that there always remains on hand a considerable surplus in money with which to lay in sea stores, and, when not required for this purpose, to give each boy a small sum of pocket money when he goes on liberty. Few of the boys can get out of debt for clothing, &c., under five months, and the occasional dollar from the mess fund is a great boon to them. There is some danger that a caterer, ambitious of accumulating a large money surplus, might be tempted to place the boys on too short an allowance, although this has not occurred thus far. Most of the boys seem to thrive well and increase in weight and general development, although they have been too short a time under my observation to enable me to give any statistics of any value.

In my opinion boys between the ages of fourteen and sixteen are too young for the training service, the majority of them being too small for the work and hardships imposed on them. There is also wanting in them that manliness and that desire to accomplish their duties well, to be found in boys of sixteen and over; in a word, they are children, and better fitted for a kindergarden than for a man-of-war. If they are to be enlisted, they should be subjected to the most rigid physical examination, and, after passing this, should be kept on board the New Hampshire for a year before being sent to sea-going ships. It seems to me important that those having enlarged tonsils should be rejected on account of their liability to tonsillitis and bronchitis. Some cases of enuresis have been found among the boys, but all have yielded thus far to very simple treatment, namely, being called within two hours after turning in and made to empty the bladder. One case only resisted this treatment, but yielded to a course of tonics. There have been a few serious cases of sickness among the boys; among these may be mentioned one sent to the hospital with pleuritis, which developed into double pneumonia; another of acute rheumatism with cardiac complications, and another of nasal fibroid polypus, which gave no sign of its existence until the boy received a slight blow upon the nose, when it at once began to develop enormously, and in ten days had grown so large as to displace the bones of the nose and absorb the nasal septum, and greatly interfere with deglutition and respiration to the extent of causing congestion of the lower lobes of the lungs. This tumor was removed at the Chelsea Hospital, when shortly afterwards another was discovered, which is also to be removed. One case of fracture of the fibula occurred in a marine while intoxicated, and is at the Chelsea Hospital.

In conclusion, I beg to make the following recommendations; that the ship be supplied with a steam-heating and distilling apparatus, to which should be appended a ventilating engine. This measure would render the ship comfortable and healthful,

and would enable her always to have a supply of good water, without running the risk of getting that which is contaminated from the shore, and would also obviate the present necessity of placing the ship's company on short allowance. There would also be more room in the hold, as the necessity for so many water tanks would no longer exist, and the few that would be required might be so arranged as to permit free access to the bilges. I may add that the absence of a sick-bay is seriously felt in a ship so crowded as is this one, as there is no place where a sick person can find seclusion or quiet. The dispensary was formerly a very narrow and cramped apartment, but has been recently changed to an old steerage, and is now larger and much lighter, and is one of the best I have ever seen on board a man-of-war.

The head is so unprotected, that in rainy weather no one can use it without exposure to the rain, and no doubt the practice, that boys and men have, of rising at night from their hammocks, and going into such a place, is a fruitful cause of disease. It should be covered in, and, if a urinal were placed on the gun deck, for use at night only, much running to the head, and consequent exposure, would be prevented.

KEARSARGE.

This vessel was at New Orleans during the first quarter of the year, sailing near its close for the West Indies. She visited Kingston, Jamaica, St. Thomas, and Samana Bay, returning during the summer to the northern coast, along which she cruised until November, when she made another cruise to the West Indies, where she was at the close of the year. She was at sea 76 days during the year, and in port 289 days. The Kearsarge reported 11 cases of zymotic disease, a ratio of $55.0\frac{0}{00}$, a considerable diminution from that of last year, which was $108.50\frac{0}{00}$. The loss of service was 33 days, and the average duration of disease 3.0 days. The daily average sick rate was $.45\frac{0}{00}$, and 2 were invalided, a ratio of $10.0\frac{0}{00}$. There were 8 cases of malarial fever, and 1 of febris typhoides. There occurred under the head of constitutional affections 35 cases, a ratio of $175.0\frac{0}{00}$, as against $78.75\frac{0}{00}$ last year. The loss of service was 397 days, an average of 11.31 days for each case. The daily ratio of sick was $5.40\frac{0}{00}$, and the invalided numbered 9, a ratio of $.45\frac{0}{00}$. The cases were chiefly adynamia (6), rheumatism (14), and syphilis (13). The nervous affections gave 13 cases, a ratio of $65.0\frac{0}{00}$, as against $67.35\frac{0}{00}$ last year. The loss of service amounted to 63 days, making the average duration 4.84 days, and the daily average ratio of sick was $.85\frac{0}{00}$. The respiratory system contributed 11 cases, a ratio of $55.0\frac{0}{00}$, nearly that of last year, which was $46.63\frac{0}{00}$. One case, or $5.0\frac{0}{00}$, was invalided. The loss of service was 46 days, and the daily average sick rate was $.60\frac{0}{00}$, while the average duration of treatment was 4.18 days. The class of diseases of the digestive system furnished 25 cases, a ratio of $125.0\frac{0}{00}$, as against $212.43\frac{0}{00}$ last year. There was no invaliding, and the loss of service amounted to 101 days, an average of 4.04 for each case. The daily average ratio of sick was $1.35\frac{0}{00}$. Diseases of the genito-urinary system numbered 21, and gave a ratio of $101.0\frac{0}{00}$, as against $82.92\frac{0}{00}$ last year. The time lost was 338 days, and the average daily number of sick was $4.60\frac{0}{00}$. The duration of treatment averaged 16.09 days. One case of nephritis was invalided to hospital. There were 42 cases of skin disease, giving a ratio of $210.0\frac{0}{00}$, as against $305.69\frac{0}{00}$ last year. The number of sick days was 210, an average of 13.40 for each case. The ratio of the sick daily was $7.70\frac{0}{00}$, and 1 case of impetigo was invalided. Injuries contributed 28 cases, a ratio of $140.0\frac{0}{00}$, as against $217.67\frac{0}{00}$ last year, showing a very decided falling off. There was a loss of 222 sick days, the average duration of treatment having been 7.92 days. The daily ratio of patients was $2.45\frac{0}{00}$, and there was but 1 invalided to hospital, a case of contusio.

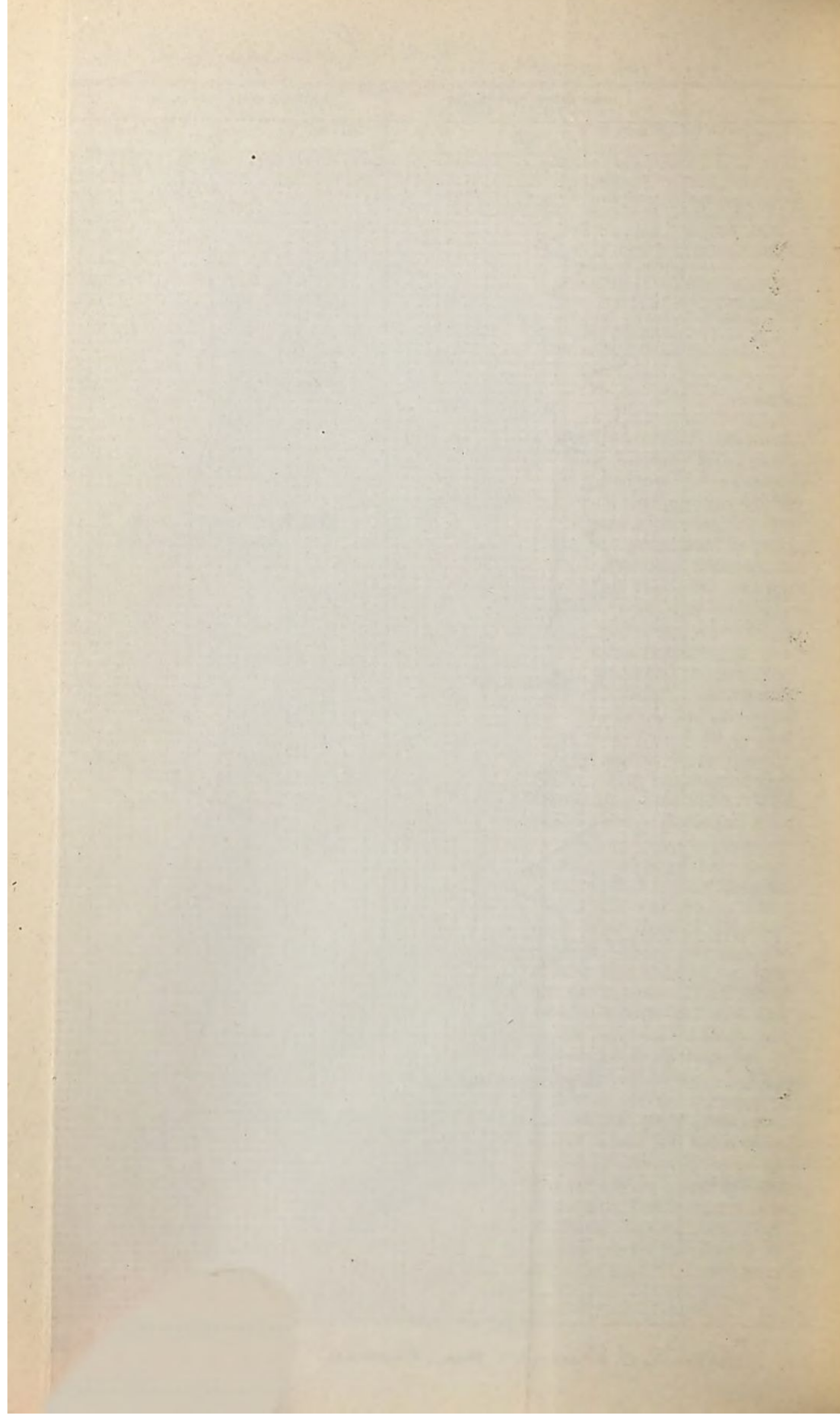
U. S. S. *Learsarge*

C. W. Gravatt

P. A., Surgeon.*

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											215	+	18.4	6	4	New Orleans
February											210	+	17.8	10	4	do.
March											215	26.1	23.6	1	5	do.
April											206	25.1	20.6	5	3	St. Thomas 2 to 5. Samana Bay 7 to 13 Hampton Roads from 22
May											200	22.3	14	6	4	Hampton Roads ret to 9 & 30, 31.
June											200	26.1	24.2	3	4	Hampton Roads to 12 Norfolk from 13
July											190	27.7	25.6	8	1	Norfolk
August											191	25.5	23.1	5		Norfolk to 17 New Castle, N.H. 21 to 26 Portland Me. 28 to 31
September											194	22.6	16.4	8	4	Portland Me. 192. Eastport Me. 7 San Habor Me. 10 to 12 New Castle N.H. 13 to 19 New York 28 to 30.
October											185	21.7	16.6	6	1	
November											185	+	17.8	10.6	6	
December											185	+	21.2	14.6	9	4

* Surgeon H. C. Drennan from November † Steam heat § Berth Deck shellacked



Surgeon M. C. Drennan makes in his report the following suggestion in regard to ships cruising in the West Indies:

During the present stay in the tropics many precautions have been taken to prevent the introduction of sickness on board of ship. In my opinion, one of the worst features of a West India cruise is the system of supplying messes with provisions. The market boat is an evil to be abolished. Servants are not noted for good judgment in regard to sanitary matters; the hours at which they go on shore, and the time they take in making purchases and attending to their private affairs, afford the crew of the market boat ample opportunity to expose themselves to influences deleterious to health. Arrangements should be made with a victualer to supply all provisions needed, and it is doubtful if there would be an increase of expense by such change.

LEHIGH.

The Lehigh, iron-clad, lay in ordinary during the year, at City Point, Va., having a complement of 14 men. Zymotic affections formed the principal part of the diseases reported, there having been 6 cases, a ratio of $428.57\frac{0}{0}$. Five of these were of intermittent fever and 1 of vaccina. The loss of service was 21 days, and the ratio of sick daily was $3.57\frac{0}{0}$; all were returned to duty. There were reported 3 cases of constitutional diseases, 2 of rheumatism and 1 of consecutive syphilis, making a ratio of $214.29\frac{0}{0}$; of these 2, or $142.85\frac{0}{0}$, were discharged to hospital. The ratio of sick daily was $5.71\frac{0}{0}$, and the loss of service 32 days. One case of cephalalgia was returned, which was the only nervous disease, and the ratio was $71.43\frac{0}{0}$. The respiratory and digestive classes each contributed one case, giving the same ratio.

MAHOPAC.

This vessel, also an iron-clad, was in ordinary at City Point, James River, during the year. Among a total of 11 cases, there were reported 4 of intermittent fever, making a ratio for the zymotic class of $250.0\frac{0}{0}$, with a loss of 11 days' service, and a daily average sick rate of $1.87\frac{0}{0}$. The constitutional, nervous, and respiratory groups each contributed 1 case, the ratio being $62.5\frac{0}{0}$ in each case, while in the genito-urinary group there occurred 3 cases, giving a ratio of $187.50\frac{0}{0}$. Two of these were chancroides, and 1 gonorrhœa, and the loss of service amounted to 30 days. One of the former cases was invalided to hospital, the ratio being $62.5\frac{0}{0}$.

MAYFLOWER.

This vessel was used, during the summer months, as a practice ship for naval cadets at the Academy, her service being chiefly in the Chesapeake Bay and in Hampton Roads. The zymotic class of diseases contributed 4 cases of intermittent fever, 1 of which was sent to hospital, making the ratio of admissions $363.63\frac{0}{0}$ and of invaliding $90.90\frac{0}{0}$. The loss of service was 33 days, and the average ratio of sick daily was $31.81\frac{0}{0}$. The duration of treatment was 8.25 days. The constitutional and nervous groups of disease gave each 1 case, a ratio of $90.90\frac{0}{0}$. In the digestive group there were 6 cases, giving a ratio of $545.45\frac{0}{0}$, with a loss of 13 days, and giving a daily rate of $12.72\frac{0}{0}$. The class of genito-urinary diseases gave 5 cases of gonorrhœa, a ratio of $454.54\frac{0}{0}$, with a loss of 24 days, service, or 4.8 days for each case. The daily average sick rate was $23.63\frac{0}{0}$, and there was no invaliding. The group of injuries comprised 2 cases of vulnus contusum, which caused a loss of service of 29 days. The ratio of admissions was $181.81\frac{0}{0}$, and of the daily sick $28.18\frac{0}{0}$. The average duration of sickness was $14.5\frac{0}{0}$.

MANHATTAN.

This iron-clad formed one of the fleet of iron-clads in James River lying at City Point, Va. Of the 11 cases of disease reported from this vessel, 7 were of intermittent fever, which was the only disease represented in the zymotic class. The ratio contributed by admissions was $38.06\frac{0}{00}$, the ratio of sick daily was $6.92\frac{0}{00}$, and the loss of service amounted to 33 days. One case was invalided, and 1 died, the ratio in each case being $76.92\frac{0}{00}$. The other cases reported were single cases of nervous and digestive diseases, and 2 occurring in the class of genito-urinary affections, the latter causing a loss of 89 days, and a ratio of sick daily of $18.46\frac{0}{00}$. These cases were of chancroid and orchitis.

MICHIGAN.

The Michigan continued in service, during the year, on the lakes, remaining during the winter season at Erie, Pa., with a complement of 91 men. In the zymotic class of diseases there were 8 cases returned, a ratio of $87.92\frac{0}{00}$, as against $22.47\frac{0}{00}$ last year. They included 1 of febricula, 2 of febris enterica, 3 of febris intermittens, and 2 of febris remittens. One of the cases of typhoid fever was invalided to hospital. The loss of service was 149 days, or an average of 18.62 days for each case, and the daily average sick rate was $4.39\frac{0}{00}$. The invaliding rate was $10.98\frac{0}{00}$. The constitutional class of diseases gave 5 cases, a ratio of $54.95\frac{0}{00}$, as against $89.88\frac{0}{00}$ last year. The cases were entirely of rheumatism and consecutive syphilis, and all were returned to duty. The loss of service was 68 days, and the daily average ratio of sick was $1.97\frac{0}{00}$. The nervous affections comprised 2 cases of epilepsy, both of which were invalided to hospital, and 1 of sciatica. The ratio of admissions was $32.95\frac{0}{00}$, the loss of service 54 days, and the daily average number sick $1.53\frac{0}{00}$. The invaliding rate was $21.97\frac{0}{00}$. From the severity of the season at Erie, respiratory affections largely prevail during the winter, the ratio for the year 1882 having been $219.78\frac{0}{00}$, more than double that of 1881, which was $101.11\frac{0}{00}$. Twenty cases fell within this group, of which 16 were catarrhal and bronchial, and 2 pneumonia. Of the latter, 1 died and 1 was transferred to hospital, the ratio in each case being $10.98\frac{0}{00}$. The loss of service amounted to 150 days, or 7.5 days for each case, and the daily ratio of sick was $4.50\frac{0}{00}$. Diseases of the digestive system contributed 14 cases, giving a ratio of $158.86\frac{0}{00}$, as against $280.89\frac{0}{00}$ last year, causing a loss of service of 69 days. Six of the cases were tonsillitis, and the others incidental diseases of the class. One case of congestio hepatis was invalided to hospital, the ratio being $10.98\frac{0}{00}$. The daily average sick rate was $1.97\frac{0}{00}$. There were returned 10 cases of skin diseases, of which one half were of abscesses. The ratio of admissions was $109.89\frac{0}{00}$, as against $280.89\frac{0}{00}$ last year. One case of cellulitis, or $10.98\frac{0}{00}$, was invalided to hospital. The loss of service was 63 days, and the daily average sick rate was $1.86\frac{0}{00}$. Sixteen cases of injury gave a ratio of $175.83\frac{0}{00}$, as against $179.77\frac{0}{00}$ last year, 1 of which was a death by drowning. There were 6 cases of contusio, and 3 each of stremma and vulnus laceratum. The loss of time was 415 days, and the daily average sick rate was $12.41\frac{0}{00}$.

MINNESOTA.

This ship, used as a training ship for boys, was at Newport during the first half and at New York during the second half of the year. The

zymotic diseases included 7 cases of intermittent fever and 2 of vaccina, giving the small ratio of $45.8\frac{0}{00}$. The loss of service was 31 days, and the daily ratio of sick averaged $4.0\frac{0}{00}$. All the cases returned to duty after an average duration of 3.44 days. The constitutional affections yielded 15 cases, a ratio of $75.0\frac{0}{00}$, and a daily average ratio of $2.45\frac{0}{00}$. The cases included 8 of rheumatismus, of which 2 were invalided; 4 of syphilis, of which 3 were invalided, and 2 of lumbago. The loss of service was 182 days, and the average duration of treatment 12.13 days. The average ratio of the daily sick was $2.45\frac{0}{00}$, and the invaliding rate $25.0\frac{0}{00}$. Diseases of the nervous system contributed 5 cases, a ratio of $25.0\frac{0}{00}$, as against $18.18\frac{0}{00}$ last year. The loss of service was 15 days, and the daily sick rate was $.20\frac{0}{00}$. There were 12 cases of disease falling in the group of respiratory diseases, of which 5 were acute bronchitis, 3 each of catarrhus and laryngitis, and 1 each of phthisis and pneumonia. The ratio of admissions was $60.0\frac{0}{00}$, and that of the daily sick $.70\frac{0}{00}$. The loss of service was 54 days, and the average duration of treatment 4.5 day. The invaliding rate was $5.0\frac{0}{00}$ for 1 case of phthisis.

The group of diseases of the digestive system contributed 27 cases, a ratio of $138.46\frac{0}{00}$, a decided diminution from last year, when it was $223.27\frac{0}{00}$. The loss of service was 135 days, the average daily number of sick $1.84\frac{0}{00}$, and the average duration of treatment 5 days. Four cases, a ratio $20.51\frac{0}{00}$, were invalided to hospital. Diseases of the genito-urinary system gave 6 cases, 3 of chancroides, 2 of gonorrhœa, and 1 of phymosis. The ratio of admissions was $30.0\frac{0}{00}$, as against $31.16\frac{0}{00}$ in 1881. The loss of service was 125 days, an average of 20.83 for each case, and the daily average ratio of sick was $1.70\frac{0}{00}$. There were 31 cases of skin diseases, mostly furunculus (15), paronychia (10), giving a ratio of $155.0\frac{0}{00}$, as against $122.07\frac{0}{00}$ last year. The invaliding ratio was $10.0\frac{0}{00}$, and the daily average sick ratio was $3.65\frac{0}{00}$. The number of days lost was 155, and the average duration of treatment 8.64 days. The number of cases resulting from violence was 34, making a ratio of $170.0\frac{0}{00}$, as against $192.20\frac{0}{00}$ last year. The number of sick days was 182, and the average length of treatment 5.35 days. The average number of sick days was $2.45\frac{0}{00}$, and the invaliding rate was $10.0\frac{0}{00}$.

MONTAUK.

The Montauk, iron-clad, was in ordinary at Washington during the first six months of the year, and was then fitted out for a cruise at sea. She was employed in the Chesapeake Bay and along the coast as far as Norfolk, and she was put out of commission in December. She reported, in the zymotic group, 10 cases of intermittent fever, and 1 of febricula, making a ratio of $250.0\frac{0}{00}$, with a loss of 26 days' service. The daily ratio of sick was $1.62\frac{0}{00}$, and the average duration of treatment 2.36 days. Two cases were invalided to hospital, a ratio of $46.51\frac{0}{00}$. Among the constitutional group appeared 1 case each of hypertrophia and rheumatismus acutus, both of which were invalided to hospital, the ratio being $46.51\frac{0}{00}$ in each case. The loss of service was 22 days. The nervous, respiratory, digestive, and genito-urinary groups gave each 1 case, with a ratio in each case of $23.25\frac{0}{00}$, and there were three cases of skin diseases, giving $69.76\frac{0}{00}$ as the ratio, while the loss of service was 16 days.

There were 3 cases of injury, $69.76\frac{0}{00}$, and a daily sick rate of $1.39\frac{0}{00}$, with a loss of service of 20 days, an average of 6.66 days for each case. The cases were contusio, wounds, and stremma.

Assistant Surgeon J. M. Edgar makes the following suggestion in his sanitary report:

The main factors of ill-health on this ship consist in non-protection, for the men, from extreme heat and cold, together with inadequate sleeping quarters, each occupant of the berth-deck having on an average 65 cubic feet of breathing space. This could be obviated by having a portion of the spar-deck housed, aft of the turret. This housing could be erected in such a manner that its demolition could be easily effected before going into action. A space 25 by 35 feet would be adequate. The walls should be double, with a space of about two inches between the internal and external linings. By this contrivance the air would be maintained at a more uniform temperature. This building should have at one end a cooking galley, and at the other, what is greatly needed, a sick bay.

The berth-deck being deficient in its steam-heating apparatus, should have at least nine more steam coils, situated on the forward part of this deck.

MIANTONOMOH.

This vessel, a double-turreted iron-clad, was in service during a period of three months during the fall, lying at Philadelphia and Washington navy-yards. The zymotic, nervous, and constitutional groups were each represented by a single case, the ratio in each class being $30.30\frac{0}{0}$. In the digestive group there were 3 cases, or $90.90\frac{0}{0}$, all of which were invalided to hospital, the cases being of diarrhœa acuta, enteritis, and hernia. More than half the cases on this ship were of injuries, the ratio being $212.12\frac{0}{0}$, and the loss of service 68 days. The average ratio of sick daily was $2.27\frac{0}{0}$, and the average duration of treatment 9.71 days. One case of contusion was invalided to hospital, or $30.30\frac{0}{0}$.

NANTUCKET.

This iron-clad vessel was in service during the latter half of the year, and her service was in Chesapeake Bay, Hampton Roads, and the Hudson River from New York to West Point. Her complement was 70 men, but, corrected for the year, averaged 26. The zymotic affections were largely represented in her returns, 6 cases having been reported, a ratio of $230.76\frac{0}{0}$, comprising two cases of febricula, 1 each of simple, continued, and intermittent fevers, and two of remittent fever, and the two first were invalided. The ratio of daily sick was $3.84\frac{0}{0}$, and for the invalided $76.92\frac{0}{0}$. The loss of service was 15 days. There was one case falling in the group of constitutional affections, and 2 in the respiratory group, the ratios being $38.46\frac{0}{0}$ and $76.92\frac{0}{0}$, respectively. There were 7 cases of injury, or $263.23\frac{0}{0}$, of which 2 cases, or $76.92\frac{0}{0}$ were invalided to hospital. The loss of service was 33 days, and the daily average number of sick was $9.23\frac{0}{0}$.

NEW HAMPSHIRE.

This vessel is a wooden sailing ship of the second rate, which was employed during the entire year as an apprentice training ship, at Newport, R. I., with an average complement of 212. As the *personnel* is largely composed of entering apprentices, often boys of tender age, the sick rate has been unusually high, more especially in those classes likely to be influenced by climatic and dietetic influences. In the zymotic class there were reported 66 cases, of which 26 were intermittent fever (reported by the surgeon to be imported), 21 vaccina, and 10 febricula. One case of erysipelas occurred, which was invalided to hospital, and there was a case of cerebro-spinal fever, which terminated fatally. The ratio of admissions was $160.19\frac{0}{0}$, of the invaliding to hospital and from the service, of each, $2.42\frac{0}{0}$, and the daily average number of sick was $3.76\frac{0}{0}$. The average duration of treatment was $9.03\frac{0}{0}$, and the death

rate $2.42\frac{0}{0}$. The constitutional affections contributed 36 cases, including 3 of anæmia, 6 of lumbago, 17 of rheumatism, 1 each of scrofula and senectus, and 8 of syphilis. The cases of rheumatism were some of them severe and attended with cardiac complications. Four cases of rheumatism and 1 each of syphilis and anæmia were invalided. The ratio of admissions was $87.37\frac{0}{0}$, as against $114.58\frac{0}{0}$ last year; the average number of sick daily was $3.90\frac{0}{0}$, the total loss of service 589 days, and the average duration of treatment 16.36 days. The invaliding was as follows: To hospital, $13.56\frac{0}{0}$, and from the service, $2.42\frac{0}{0}$. Eight cases were classed among affections of the nervous system, giving a ratio of $19.41\frac{0}{0}$, and a loss of time equal to 70 days. The daily sick rate was $.46\frac{0}{0}$, and the average duration of treatment 8.75 days. There were 2 cases each of epilepsia and cephalalgia, and 1 each of chorea, dementia, meningitis, and vertigo. The case of chorea was invalided to hospital, and that of dementia, with one of epilepsia, from the service, and the case of meningitis was fatal. The invaliding rates were as follows: to hospital $2.42\frac{0}{0}$, and from the service $4.85\frac{0}{0}$.

Diseases of the respiratory organs gave 37 cases, with a ratio of $89.80\frac{0}{0}$, resulting in a loss of service of 502 sick days, and average daily sick rate of $3.32\frac{0}{0}$. The average length of treatment was 13.56 days. The admissions were largely for bronchitis, of which there were 28. The case of catarrhus, or $2.42\frac{0}{0}$, was invalided from the service. There were reported 80 cases of diseases of the digestive system, giving a ratio of $194.17\frac{0}{0}$, and a loss of 375 days. The daily average sick rate was $2.47\frac{0}{0}$, and the average duration of treatment 4.68 days. Two cases of hernia were invalided, 1 to hospital and 1 from the service, the ratio of each being $2.42\frac{0}{0}$. In the group of diseases of the genito-urinary system there appeared 25 cases, nearly one-half of which (10) were of emissio, occurring among the apprentices. The ratio of admissions was $60.67\frac{0}{0}$, and that of the daily sick, $2.01\frac{0}{0}$. The number of sick days was 305, so that the average duration was 12.2 days. Two cases, $4.85\frac{0}{0}$, were invalided to the hospital, and 1, $2.42\frac{0}{0}$, from the service. The cases of skin disease numbered 63, giving a ratio of $152.91\frac{0}{0}$, and a daily sick rate of $3.05\frac{0}{0}$. The loss of service was 4.63 days, and the average duration of treatment 7.34 days. The number of those invalided to hospital was 15, or $36.40\frac{0}{0}$, of which 12 were scabies, and 1 case of hernia was from the service. Injuries gave 91 cases of sickness, a ratio of $220.87\frac{0}{0}$, and 912 sick days. The principal factors in the class were vulnus contusum (27) and stremma (13). The average sick rate was $6.04\frac{0}{0}$, and the duration of treatment 10.02 days. There were two deaths from suicide and drowning. The invalided were 2 to hospital and 2 from the service, the ratio, in each case, being $4.85\frac{0}{0}$, the same figures standing for the death rate.

Surgeon J. C. Wise makes the following sanitary report:

The general sanitary condition of the ship is excellent, and the health of the officers and crew, the latter largely composed of entering apprentices, has been good with the exception of an excess of preventable disease at certain times, which will be more fully noticed hereafter.

The natural lighting is good on all decks except the orlop; this defect is to be remedied by the introduction of large circular air-ports in addition to those already existing, when this deck, which is shellacked and seldom wet, will be the most comfortable in the ship. A house covering the spar-deck between the main and mizzen masts has cut off the light to some extent from the lower decks, but the two gun-decks are so amply provided for by gun-ports containing window glass that the loss is not felt. The artificial lighting is not as good as it should be; lamps furnished the ship have been in many instances too much worn for service, and in others the mechanism has been such as to become easily disordered in the hands of the lamp-lighter. At this time, however, the upper gun-deck is fairly illuminated by two

locomotive and five standing lights; there are five standing lights on the lower gun-deck, and the same number on the orlop, which are insufficient.

The electric light is most desirable on this ship in consideration of the difficulty of proper lighting by the usual means, and the nature of the ship's company.

The heating is accomplished by steam generated in a boiler located on the spar-deck; there are three small heaters on the upper and five on the lower gun-decks; the orlop is abundantly but irregularly heated by the pipes supplying steam to the heaters on the upper decks; the ward-room is insufficiently heated. The apparatus for heating, with the exception of the boiler, were put up hurriedly last winter; the pipes were so distributed that the heating is not equable and in some parts of the ship insufficient. It would have been conducive to health had it been so arranged that steam might be cut off from one deck independently of the others. The boilers placed in the hold would not only conserve much heat, now lost, but, by creating ascending currents, have assisted materially in ventilation.

No changes have been made in the facilities for ventilation since the last report was submitted. An exception to this exists in the fact that the ship instead of swinging head to the wind is now moved stem and stern, thus improving cross-ventilation; but what is gained in this respect is lost in the greater exposure. The great objection to the ventilation on this ship is that which holds on all our vessels of war in winter, viz, a choice between closed ports and crowd-poisoning on the one hand, and open ports with draft and its attending evils on the other. In fine weather no better ventilation could be desired than that attainable through sixteen large gun-ports on either gun-deck, with four large hatchways in addition. I have never noticed foul air on the orlop, except in the cells. An apparatus to change the air when bad weather requires the closing of the ports and hatchways is not only desirable but requisite if this ship should be populated to her full capacity; our safety heretofore has rested on the fact that the individual air space has been very great. The idea of an aspiratory ventilator was mooted last year, and should a ship be the future abode of the entering apprentice its importance cannot be too strongly urged. The house erected on the spar-deck is provided with ridge ventilation.

The water-closets on the gun-deck (upper) are in need of repair, as they from time to time give rise to leaks on the sick-bay just beneath them.

In connection with the boiler house is a bath room containing sixteen tubs, where each boy is required to bathe once a week; the tubs are supplied with warm water. This arrangement cannot be too much commended, and it seems that on a smaller scale it might be applied to other ships of war.

While much attention has been given to the desirability of a dry ship, the result has not been so good as might have been attained with the aid of proper appliances for drying. The table gives the amount of wetting for last quarter 1882:

Deck.	Holy-stoned.	Clamped.	Rain or snow.	Total.
Spar-deck	15	16	12	43
Upper gun-deck	14	13	.....	29
Lower gun-deck	11	11	.....	22

When it is remembered that there are three decks to be kept clean (the orlop being shellacked), it is evident that the wetting is not so great as usually obtains on our men-of-war; the wise policy of wetting but one of the gun-decks at a time is followed. As there were ninety-two days in the quarter, it will be seen there was a wet deck nearly every day. In a climate so damp as Newport, indeed on any ship in the winter season, this is too frequent, and will surely entail evil results. With the exception of the spar-deck, the wetting has not been greater than necessary for cleanliness, if this method of cleaning is to be used. The question here arises if it would not be better to shellac another deck and to use drying stones; thus reducing the time that the air is charged with moisture. In a ship of this kind, mere routine should always give way, when to carry it on is prejudicial. Thus on October 13 the spar-deck was washed (by the routine), on the 14th the spar-deck was wet by rain, on the 16th spar-deck washed, on the 17th spar-deck wet by rain, on the 19th spar-deck washed. Certainly it would be better that the routine should be modified to suit the weather, after consulting the barometer and hygrometer. In this connection I would recommend that the heating and ventilation of the decks, especially in winter, be put in the hands of some intelligent and efficient person rather than to different individuals, so as to secure uniformity as far as practicable.

I consider the clothing outfit provided for apprentices by the training regulations sufficient, with slight exceptions. The shoes are of poor quality, and soon fall to pieces under the action of salt water; it would be true economy to issue a higher-priced

article, not to speak of the advantages on the score of health. The issue of low-quartered shoes in winter should be prohibited. I cannot too strongly urge the issue of rubber boots to boys, to prevent their going barefoot when decks are washed; the custom is injurious to the adult and perilous to boys of fourteen years of age. A special recommendation has been made to the commanding officer on this matter, from whom it will receive due consideration. Extra expense of outfit and deficient storage are the arguments against rubber boots. In regard to the first, I feel assured it would be a saving to the Government to furnish them to apprentices. The objection to storage room certainly cannot apply here, where a system of boxes and checks is employed similar to that in vogue at hotels, thus securing economy of space and ownership. I believe this would be practicable on our smaller ships in the training squadron. While I would not recommend oil suits for apprentices generally, there might be suits for the boats' crews, and owned in such a manner that they could be used by any crew called away in bad weather.

The messes of the apprentices are distinct from those of the men, and are provided for by a caterer, under the supervision of a commissioned officer. The arrangements for messing are most creditable, and it would be a great desideratum to have them more generally introduced in the service. The tables are so arranged that after the meal they can be secured overhead, and when set they are covered with an oil-cloth. Each boy is provided with plate and bowl of enameled ware, a spoon, knife and fork. The enameled ware is made of galvanized iron, is neat, light, and does not rust. In lieu of the mess-chest, which is kept clean with difficulty, a cupboard with wire doors, exposing the interior, is substituted. This, however, would not be so desirable on ships with dark decks, where the mess-chest can be transported above and periodically cleansed. The cooking is conducted in an improved galley, and is generally well done. Bread of excellent quality is baked nearly every day, by a professional baker. A landsman is detailed to every two messes, consisting of two guns' crews, or thirty-two boys. Heretofore there has been no regular diet list, and feeling the good which might be derived from more system in the matter, such recommendation was made that a board was ordered to frame a diet list, a copy of which is herewith forwarded. All the rations are now commuted, and the board had to meet the difficulty of furnishing a fresh ration four days in the week for the commutation price of thirty cents per diem. It is questionable if the nutritive equivalent of the naval ration can be purchased at this place for that amount. The main errors in the existing system were found to be an excess of starchy food, a deficiency of nitrogenous food, lack of variety, and too much coffee.

These errors were corrected in the ration suggested as far as the limited means would permit, but such a change as chocolate for coffee thrice a week could not be made. The board, in my opinion, wisely introduce three salt rations per week, in order to gradually initiate the apprentice on ship provision. In view of the fact that a growing lad cannot live for a lengthened period on ship provision or salt food without detriment to his physical development, and, as is probable, the equivalent of the ration cannot be obtained at open purchase for its commutation price, it would seem to be wise policy to increase the latter in the case of apprentices. As it is estimated that one-third of the nutritive element of meat is dissolved in the brine, and thus lost, the issue of one pound of salt meat as the equivalent of one pound of preserved meat, or one and a quarter pound of fresh meat (this being the case in the Navy ration), is unscientific at least. The meal hours are very badly arranged—breakfast at 8 o'clock, dinner at noon, supper at 4.30 o'clock p. m. The apprentice is called with all hands between 5 and 6 o'clock, and thus is two hours without food; four hours after, the dinner hour arrives, and in another period of four and a half hours supper is at hand, so that all the meals are taken in a period of eight and a half hours. A good breakfast should be eaten about 7 o'clock, dinner at noon, as now, and supper in winter at 5, in summer at 6 o'clock. The usual difficulty of interference with ship's routine again presents itself here, but such matters as these are of greater importance than mere routine in a training ship. If the ship is to be the school of the future, then can there be no question that its heating, ventilation, and lighting should be of the best, and the clothing, diet, and regimen settled by most careful and patient thought.

The ship is supplied with water by the city water-works, an analysis of which was forwarded with last year's report. Though no cases of illness have been traced to its use, this water is not considered above suspicion; the reservoir drains the surface of an inclined plane, over which the sewage from several farm-houses and barn-yards passes.

I wish now to advert to some of the causes affecting the apprentice, which, though not so important as those hitherto alluded to, are at the same time worthy of careful consideration. While much in our training service has been adopted from the English system, one of its most wholesome regulations has been ignored. I refer to the limit of age for apprentices. According to a report of Mr. Blake, M. P., on "Her Majesty's training ships" (1880), the limits of age are fifteen and sixteen and a half

years. While I can see no good reason to exclude boys between the maximum here given and eighteen years, I believe most officers will agree that the English minimum is low enough. From my experience in recruiting for the training system, I find that the muscular development of the average lad at fourteen years is deficient. When we consider the duties of the entering apprentice, and reflect that it is between the sixteenth and eighteenth year that the tuberosities and articular surfaces of the lower end of the humerus have ossific union with the shaft, and that it is at the twentieth year that the lower epiphysis is firmly joined to the femur, the necessity for delaying the date of shipment is more apparent. At an age so young the resistive power is low, the undeveloped system readily succumbs to fatigue and other causes of disease. Affections of the respiratory organs and air-passages are especially liable in the young recruit.

It would seem reasonable that for the drills and exercises of boys, especially the younger classes, an equipment adapted to their slight bodily weight and development would be made. Such, however, is not the case. The apprentice entered but yesterday at fourteen years of age, and weighing 70 pounds, pulls the same length and weight of oar (the 12-foot oar weighs 10 pounds, equal to one-seventh body weight of entering apprentice), mans the same cutter, goes through the manual with the same 9-pound Remington as the able seaman. From imperfect closure of the abdominal rings, rupture is very apt to occur in the lad of fourteen and fifteen; hence the necessity for great care in this particular. During the past winter two cases of rupture came under observation from this cause. Palmar abscess, accompanied in some instances with symptoms of tetanus, were not unusual from the contusing effect of the heavy oar on the delicate structures of the palm. The apprentice differs from his older shipmates more notably in the fact that having but just come from under parental influence, he has not the providence to supply his wants, or experience to protect himself from the detrimental elements peculiar to his surroundings. It is an obligation which the Government has assumed to stand "*in loco parentis*" for the apprentice, and I am assured it is the earnest desire of the officers connected with the system to faithfully discharge the trust. The divisional, of all other officers, is brought in most intimate contact with the apprentice, and to him we should look for a satisfactory state of affairs concerning personal cleanliness and dress; yet the number of officers allowed the ship heretofore has been so small that individual attention to apprentices has been impossible. In this way lies the greatest hope for a small percentage of sick, by preventing such things as being without stockings, wearing no blue suit under the white working suit, wearing the collar rolled down to the mid-sternum, leaving off the pea-coat above the upper decks, and keeping on wet clothes; to these matters so apparently trivial are traceable a very large proportion of cases applying for treatment.

Tobacco is entirely prohibited among apprentices (that is, while attached to the training squadron), and cases of its use are extremely rare.

Comparatively little recruiting is done on this ship, the recruits coming in greatest number from the Minnesota at New York. The only defect noticeable is, that in many cases, where the recruit reaches the prescribed requirements for height, weight, and chest expansion, his general physique is not equal to the hardships of the life he is to follow. The sickness and invaliding among the drafts coming from New Orleans was so great as to give rise to the question of the advisability of transferring boys from points so far distant in the winter season.

Punishment of the apprentices has not been great, and always with deference to their age and existing physical condition. The brigs have been removed from the forward to the after part of the orlop, where the light and ventilation is better and seclusion greater.

While much has been done to conduce to the contentment of the apprentices, I would recommend more frequent landing in summer (or winter, if the weather permits), either for drill or recreation. In the evenings, before 9 p. m., the boys are allowed to get down the tables for reading, writing, or games. The ship's library, though small, contains much literature adapted to the wants of the apprentice, and is well patronized. The band, besides its regular hours, plays on Saturday evenings, when dancing is allowed. All these agencies are useful, and should be fostered. The establishment of a swimming class would be useful, not only as a healthful exercise, but also in encouraging an art which every seaman should possess.

In view of the fact that the Government has been put to large expense in sending cases of enuresis to hospital and in returning them to their homes at points sometimes so distant as New Orleans, in the condemnation of bedding which such cases render unfit for use, this matter assumes an aspect of importance. Boys addicted to this habit at the age of fourteen or fifteen years are not only noxious to the ship's company, but depress morals, so desirable in this service. So common was the complaint during the past winter that a large percentage of the drafts from New Orleans were condemned by survey and returned home within a month after joining the ship. The effort has been made on this ship to put recruits under observation before issu-

ing bedding, but where they arrive in numbers this is difficult. In receiving ships and recruiting ships, however, boys might be kept under observation for a week before acceptance for the service. As a rule the veracity of applicants in regard to this and other matters is not reliable.

Proposed ration for apprentices United States training ship New Hampshire.

Day.	BREAKFAST.		DINNER.		SUPPER.	
	Article.	Quantity.	Article.	Quantity.	Article.	Quantity.
		Oz.		Oz.		Oz.
	Bread (fresh).....	6	Pea-soup (peas).....	2	Bread (fresh).....	4
	Butter.....	1	Roast beef.....	10	Tea.....	$\frac{1}{4}$
	Coffee.....	1	Bread (pilot).....	6	Sugar.....	1
	Sugar.....	1	Potatoes.....	10	Oatmeal.....	4
	Pork and beans (warm)	6	Pie (fruit).....	2	Milk.....	5
	Beef hash.....	4	Pork.....	12	Bread (fresh).....	4
	Bread (fresh).....	6	Beans.....	4	Tea.....	$\frac{1}{4}$
	Sugar.....	1	Potatoes.....	6	Sugar.....	1
	Coffee.....	1	Pickles.....	2	Hominy.....	4
	Butter.....	1	Bread (pilot).....	4	Milk.....	5
	Bread (fresh).....	6	Soup (rice and toma- toes).....	4	Bread (fresh).....	4
	Butter.....	1	Mutton.....	10	Tea.....	$\frac{1}{4}$
	Coffee.....	1	Bread (pilot).....	4	Sugar.....	1
	Sugar.....	1	Potatoes.....	8	Oatmeal.....	4
	Pork and beans (warm)	6			Milk.....	5
	Bread (fresh).....	6	Corned beef, boiled ...	12	Bread (fresh).....	6
	Butter.....	1	Bread (pilot).....	6	Tea.....	$\frac{1}{4}$
	Sugar.....	1	Pickles.....	2	Sugar.....	1
	Coffee.....	1	Soup (rice and toma- toes).....	4	Stewed prunes.....	2
	Mutton stew.....	6			Milk.....	5
	Corned beef hash.....	4	Soup (peas).....	2	Bread (fresh).....	4
	Bread (fresh).....	6	Beefsteak.....	10	Tea.....	$\frac{1}{4}$
	Butter.....	1	Bread (pilot).....	4	Sugar.....	1
	Coffee.....	1	Potatoes.....	6	Hominy.....	4
	Sugar.....	1			Milk.....	5
	Bread (fresh).....	6	Soup (peas).....	2	Bread (fresh).....	4
	Butter.....	1	Fish (salt).....	10	Butter.....	1
	Coffee.....	1	Bread (pilot).....	4	Tea.....	$\frac{1}{4}$
	Sugar.....	1	Potatoes.....	6	Sugar.....	1
	Oatmeal.....	4			Stewed apples.....	2
	Milk.....	5				
	Bread (fresh).....	6	Pork.....	12	Bread (fresh).....	4
	Butter.....	1	Beans.....	4	Tea.....	$\frac{1}{4}$
	Coffee.....	1	Bread (pilot).....	4	Sugar.....	1
	Sugar.....	1	Potatoes.....	6	Oatmeal.....	4
	Codfish-balls.....	4	Pickles.....	2	Milk.....	5

PASSAIC.

This iron-clad served as the receiving vessel at Washington during the first half of the year, after which she was fitted for sea, and cruised during the remainder of the year in the Chesapeake Bay, along the coast, and in Hampton Roads, with a complement of 80 men. This vessel suffered very largely from the zymotic diseases, and especially from intermittent fever, of which there were 37 cases, and 9 were invalided to hospital. The ratio of admissions was $644.06\frac{0}{0}$, and of the invalided, $152.53\frac{0}{0}$. The loss of service was 158 days, and the daily ratio of sick was $9.15\frac{0}{0}$. The average duration of treatment was 4.15 days. The constitutional class included 8 cases, a ratio of $135.59\frac{0}{0}$, 3 of which were chronic rheumatism, 3 secondary syphilis, and 2 adynamia. The ratio of daily sick was $2.37\frac{0}{0}$, and the loss of service 41 days. Five cases were nvalided to hospital, the rate being $84.14\frac{0}{0}$. The respiratory class of

diseases was represented by 6 cases, a ratio of $101.67\frac{0}{00}$, causing a loss of 49 days. The daily rate of sick was $2.88\frac{0}{00}$, and the average duration of treatment 8.16 days.

There were reported 7 cases of diseases of the digestive system, a ratio of $118.65\frac{0}{00}$, of which 2 were invalided to hospital, the rate being $33.89\frac{0}{00}$. The loss of service was 35 days, and the average duration of treatment 5 days. The number sick daily from these affections gave a rate of $2.03\frac{0}{00}$.

In the class of diseases of the genito-urinary organs, 4 cases were admitted, of which 1 was discharged to hospital; making the admission ratio $67.79\frac{0}{00}$, and the invaliding $16.94\frac{0}{00}$. The loss of service was 24 days, and the average number of sick daily was $1.31\frac{0}{00}$. Eight cases were returned under the head of injuries, chiefly of wounds, contused and lacerated. The ratio of sickness from these causes was $135.59\frac{0}{00}$, and the loss of service was 32 days. The daily ratio of sick was $1.86\frac{0}{00}$, and the average duration of treatment 4 days. A single case of contusio was invalided, the ratio being $16.94\frac{0}{00}$.

PORTSMOUTH.

This vessel is a training ship for apprentices, and spent the first quarter of the year at Washington, undergoing repairs. In April she sailed for Europe, where she visited Lisbon and various of the ports of the Mediterranean. She returned in midsummer to the United States, and was employed during the fall in cruising off the coast of New England. The latter portion of the year was spent in the harbors of Newport and Boston. The ratio from 27 cases of zymotic affections which happened in this ship was $88.52\frac{0}{00}$, a loss of 163 days of service gave the average duration of treatment as 6.03 days. The number of sick daily was $1.44\frac{0}{00}$, and 2 were invalided, a ratio of $6.55\frac{0}{00}$. There was 1 death from febris enterica, a ratio of $3.27\frac{0}{00}$. The cases were principally as follows: febricula 8, febris continua simplex 9, of which 2 were invalided, febris enterica 1, febris intermittens 8. Under the head of constitutional diseases were entered 36 cases, which gave a ratio of $118.03\frac{0}{00}$, as against $80.07\frac{0}{00}$ last year. They included 15 of rheumatism, 11 of syphilis, 7 of lumbago, and 3 of adynamia. There were 12 invalided to hospital, the ratio being $39.04\frac{0}{00}$. The number of sick-days was 385, and the average duration of treatment was 10.69 days. The ratio of the sick daily was $3.14\frac{0}{00}$. Eight cases of nervous affections were reported, a ratio of $26.22\frac{0}{00}$, and there were 2 cases, or $6.55\frac{0}{00}$, which were invalided to hospital. The time lost was 46 days, and the average duration of treatment 5.75 days, while the ratio of sick daily from these affections was $.39\frac{0}{00}$. The respiratory class of diseases contributed 32 cases, the largest factor being bronchitis acuta, of which there were 17 cases. Of the 4 cases of phthisis chronica, 3 were invalided. The ratio of admissions was $1049.0\frac{0}{00}$, as against $120.31\frac{0}{00}$ last year; the invaliding rate was $32.78\frac{0}{00}$ for 10 cases, and the daily rate of sick was $2.81\frac{0}{00}$. The average period of treatment was 4.81 days. Diseases of the digestive system numbered 30, the ratio being $98.36\frac{0}{00}$, while that of last year was $136.84\frac{0}{00}$. The largest factors were tonsillitis, 12 cases, and hernia, 8 cases; one-half of the latter were invalided. The time lost was 193 days, and the average duration 6.43 days. There was a daily sick-rate of $1.70\frac{0}{00}$, and 9 cases, giving a ratio of $29.49\frac{0}{00}$ were invalided. Affections of the genito-urinary system presented 24 cases, a ratio of $74.56\frac{0}{00}$, as against $31.57\frac{0}{00}$ last year. The cases were chiefly gonorrhœa 5, orchitis 8, chancroides, cystitis, and enuresis, of each 3. The time

lost was 210 days, and the daily rate of sickness from these affections was $1.86\frac{0}{0}$. The invalided were 10, a ratio of $52.78\frac{0}{0}$. There were 45 cases of skin diseases, a ratio of $147.54\frac{0}{0}$, as against $122.80\frac{0}{0}$ last year, giving a daily sick-rate of $6.55\frac{0}{0}$. Five persons were invalided, making a ratio of $16.39\frac{0}{0}$. The loss of service was 730 days, the average duration having been 16.22 days. The most prominent affection was ulcer, of which there were 12 cases, and 3 invalided. The ratio from 42 cases of injury was $137.70\frac{0}{0}$, and the daily ratio of sick was $3.11\frac{0}{0}$. Seven cases, or $22.95\frac{0}{0}$, were invalided, and there were 2 deaths, 1 from *concussio cerebri*, and 1 from *vulnus incisum*, the ratio being $6.55\frac{0}{0}$. The time lost was 349 days, and the average duration 8.30 days.

Surgeon R. A. Marmion makes a sanitary report up to the date of his detachment in November, from which the following extracts are made :

It seems probable that the health of the steerage officers has been affected by the overcrowding consequent upon an increase in their number. This question came under consideration in July, when a midshipman was taken sick with continued fever, which was later complicated with pneumonitis and typhoid symptoms, and proved fatal. There was nothing in the character of the water or provisions to account for the attack, and the fact that no other case occurred on board seems to prove that there was no general morbid influence at work. For more than a year four persons had been sleeping in the steerage without any bad effects, and supposing the disease to have been due to the bad air of the steerage, it could only be due to the fact that it was a frequent practice for six or more persons to congregate there for hours at a time regardless of the condition of the atmosphere. Upon my recommendation, therefore, the bunks were removed from the steerage and its use as a sleeping apartment is no longer allowed.

It is to the cheerful and prompt co-operation with the medical officers of our ships on the part of officers on board must we look for the prevention of disease. To effect this the divisional and watch officers should be charged to see that those under their command pay proper attention to the laws of health, especially in the matters of appropriate clothing and the avoidance of exposure. A regulation requiring this is imperatively demanded in the training service, for boys are incapable of exercising any judgment in such matters. I have more than once endeavored to have such supervision established, but with only temporary success.

In my former annual reports I have called attention to the defects of this ship in the matters of ventilation and lighting. The two extremities of the berth-deck, namely, the sick-bay and the after end of the ward-room, are sadly in need of light and air, both of which can be introduced at comparatively little expense, through tubes carried to the spar-deck, surmounted by a movable sky-light. The putting in of larger air-ports in both cases is perfectly feasible, and is recommended as most desirable. Since my last report the dispensary has been moved forward, adjoining the sick-bay, which is a very convenient and rational situation for it. Unfortunately, at the same time the cell was built amidships around the foremast, which has necessarily interfered with the circulation of air on the berth-deck. All things considered, there seemed to be no other course to pursue, and if the ventilation of the berth-deck has been impaired that of the cell has been materially improved.

The health of the ship's company has been excellent during the past year, and for the first time since this vessel became a training ship there has been no epidemic influence of any kind at work on board. The good health that has prevailed, however, was, I think, due more to the comparatively cool and dry weather experienced during the entire year than to her sanitary condition. In addition to the defects of ventilation there is a good deal of rotten wood in the bow and stern and, I am informed, in the hold under the tanks. Attention was called to this subject last winter while the ship was undergoing repairs at a navy-yard, but nothing was done to remedy it. Instead of being replaced by new and sound material, the rotten wood, in one instance at least, was merely covered up with boards, perforated, so as to throw the effects of decay into the air of the berth-deck.

It is an unfortunate commentary on the thoroughness of the work done upon the ship that notwithstanding the fact that she has spent the past three winters at a navy-yard undergoing extensive repairs, she should still have so much decayed wood in her as to endanger the health of the crew. Thus far it may be said that appearances alone seem to have been consulted in deciding what repairs should be made, and new spar and gun decks have replaced the comparatively unsightly old ones, but nothing has been done to the berth-deck nor hold, although much needed. Upon my recommendation the berth-deck has been kept well shellacked all summer, and other meas-

ures have been adopted for keeping it dry, and as well ventilated as possible, with satisfactory results.

Through a system of commutation of about one-fourth of the rations in the boys' messes, a fund has been obtained for the purchase of vegetables in quantity before the ship goes to sea, and thus far they have always been kept plentifully supplied, even during a thirty-day passage. A competent man has charge of the supply thus obtained, and waste or extravagance is thus prevented. Chocolate has been substituted for part of the coffee ration. I believe it was thought that its adoption would prevent or diminish the cases of enuresis among the boys. While I cannot agree with those who attribute enuresis to the use of coffee, I quite agree with them that coffee is otherwise objectionable, and I have recommended that it be allowed them only on turning out in the morning and at breakfast. At dinner and supper chocolate is the rule now, and seems to be well liked by the boys. The dietary of the men does not differ from that on board of other ships.

Surgeon A. M. Moore, whose report covers the remainder of the year, makes the following remarks :

The imperfect means of heating the ship, referred to in Dr. Marmion's report, has been practically demonstrated since it was made, by the amount of suffering from cold to which the crew, composed in greater part of boys of comparatively tender age, were subjected—to the extent of producing chilblains and frost-bite in twenty to thirty cases—while making the trip from Martha's Vineyard to Boston, in the latter part of November; for while the greatest exposure was on the spar-deck, where it was unavoidable, yet if the gun and berth-decks had been properly heated, so that the crew could have been comfortably warm while between decks, the inflammation of the cutaneous tissue which followed would have been avoided.

The inadequate supply of heat has been also shown by the unusually large number of cases (33) which it was found necessary to transfer to hospital for treatment during the quarter for diseases affecting the respiratory organs and fibrous tissues, largely due to exposure to cold and dampness. The facilities for heating the gun-deck consisted of two stoves and the cooking galley. For the berth-deck, nothing except the stove in the ward-room. Recently one more stove has been placed on the gun-deck, and another about midway the berth-deck, and these additions, while they do not go to the root of the matter, constitute a great improvement. The method of heating ships by stoves is, however, antiquated, cumbersome, and inefficient. As a matter of economy, therefore, to the Government, a proper system of heating should be introduced.

A distilling apparatus could also be added at small cost, which would occupy but little space, so that all habitable parts of the vessel could be uniformly and economically heated and dried by means of steam coils, and by a comparatively small additional expense a sufficient supply of fresh water could be obtained.

POWHATAN.

This vessel has been engaged during the year in special service, in which she has cruised along the coast of the United States, making a somewhat extended trip to the West Indies, from which she returned in May. Since that time she has made a trip to Pensacola, towing a section of dry-dock, and more recently has been engaged on the coast of New England. During the year she was at sea 82 days, and in port 283 days. Her complement is 251. The number of cases returned from this ship under the head of zymotic affections was 28, of which 12 were of intermittent fever, and 12 remittent fever. The ratio of admissions was $111.55\frac{0}{0}$, and the average daily sick-rate $2.31\frac{0}{0}$. There was a loss of time equal to 212 days, and the average duration of treatment was 7.57 days. Three cases invalided, a ratio of $11.95\frac{0}{0}$. The admission rate for last year was nearly the same as the present one, viz, $112.56\frac{0}{0}$. Of the constitutional affections there were reported 13 cases, a ratio of $51.79\frac{0}{0}$, as against $31.41\frac{0}{0}$ in 1881. Of these, 8 cases were of rheumatism and 5 of syphilis. The resulting loss of service was 125 days, the average duration of treatment having been 9.61 days. The daily ratio of cases under treatment was $1.35\frac{0}{0}$, and that for the invaliding $15.93\frac{0}{0}$. In the class of nervous affections but 1 case of neuralgia was reported, a remarkable exemption from affections coming under this head. The

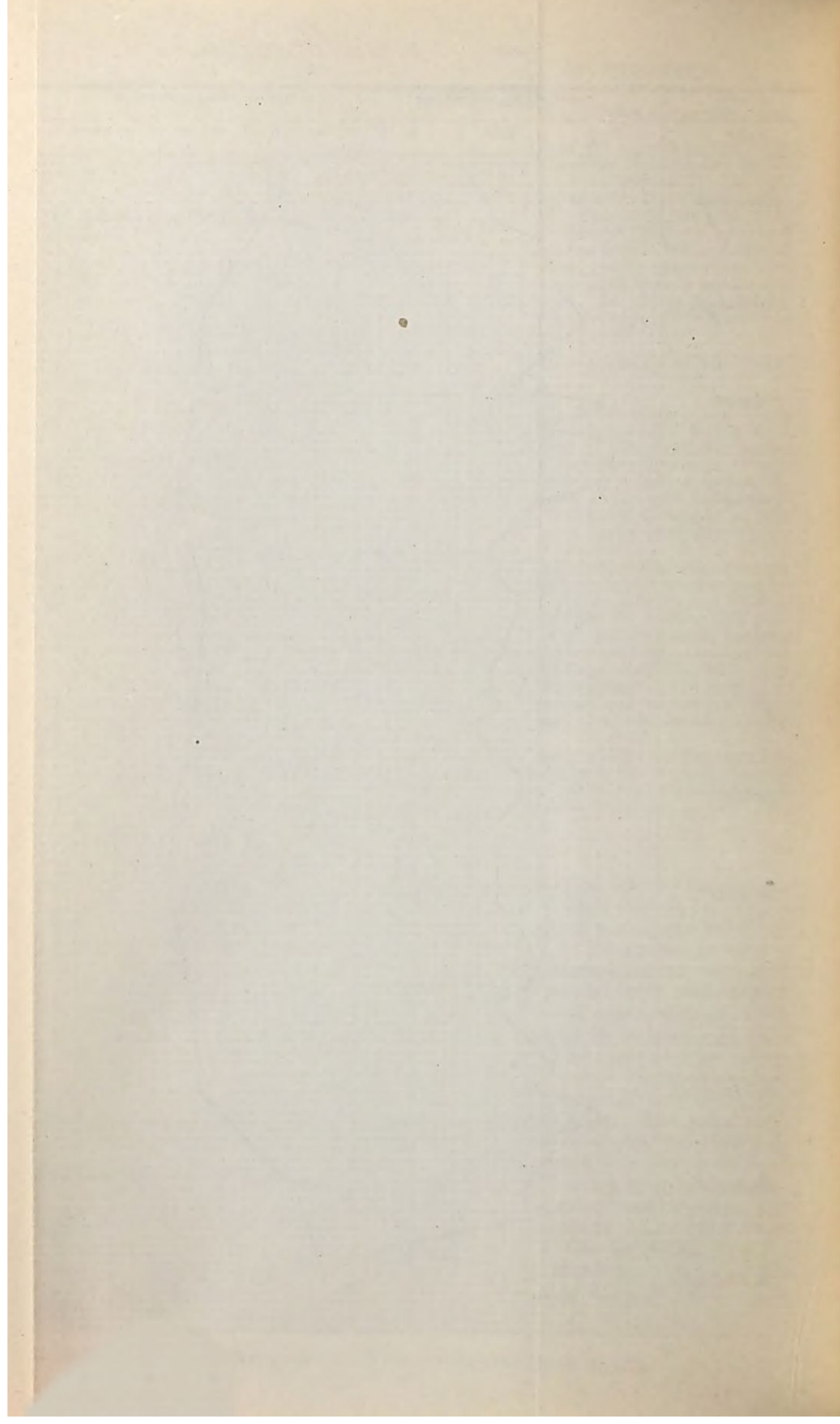
U. S. S. Powhatan

J. B. Walton

, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW OR RAIN.	DAYS BERTH DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											255	†	13	19	22	* Boston to 24 Hampton Roads 28 Norfolk from 29
February											255	‡	22.7	19.8	11	Norfolk to 6 Puerto Rico 15 to 18 Samaña Bay 20 to 21 Santa Cruz from 24
March											255	25.4	27.1	13		Guadaloupe 2 to 5 Dominica 7 to 9 Martinique 10 to 14 St. Lucia 15 to 20 St. Vincent, Grenada, Trinidad 21 to 28
April											255	27.3	28.1	3		Venezuela to 3 Curaçoa 6 to 9 Jamaica 13 to 16 Havana 21 to 23 Key West from 24
May											255	20.6	19.2	9		Key West 1 Hampton Roads 7 to 18 Norfolk from 19
June											255	25.6	25	6		Norfolk to 12 Hampton Roads 13 to 14 League Island 16 to 18 Chester, Pa. 19 to 20
July											255	28.4	28.6	14		Key West 4 Pensacola 13 to 25
August											255	26.3	26.3	15		Hampton Roads 5 to 16 Norfolk 17
September											255	23.6	21.6	9		Norfolk to 6 Hampton Roads 7 to 15 New York from 18
October											245	†	18.8	16.1	10	New York to 19 Portsmouth from 26
November											245	†	15.9	5.1	9	Portsmouth 19 to 2 Boston from 4
December											230	†	16.3	3.9	10	Boston

* Berth deck wet occasionally with fresh water. † Steam heat ‡ Steam heat - 10 days.



respiratory diseases were 19 in number, showing a ratio of $75.69\frac{0}{0}$ as against $107.32\frac{0}{0}$ last year, with a resulting loss of service of 89 days. The daily ratio of sick was $.95\frac{0}{0}$, and the invaliding rate (4 cases) was $15.93\frac{0}{0}$. Diseases of the digestive system contributed 20 cases, and a ratio of $79.67\frac{0}{0}$, less than half that of 1881, when it was $183.30\frac{0}{0}$. The largest factors of the class were diarrhoea acuta and tonsillitis, each of which gave 4 cases. There were 79 sick days, an average of 3.95 days for each case. The daily ratio of sick was .83, and the invaliding rate for 4 cases was $15.93\frac{0}{0}$. Genito-urinary affections yielded the small ratio of $23.89\frac{0}{0}$, from 6 cases, of which 3 were of orchitis. The ratio last year $47.12\frac{0}{0}$. The loss of service was 49 days, and all the cases returned to duty. There were 36 admissions for skin diseases, of which 1 case of anthrax and 1 of eczema were sent to hospital. The admission rate was $143.42\frac{0}{0}$, an increase over that of last year of $96.85\frac{0}{0}$. The daily sick rate was $2.90\frac{0}{0}$, and that for the invaliding $7.96\frac{0}{0}$. There were 272 days of sickness, and an average duration of treatment of 7.55 days. Diseases resulting from violence numbered 35, giving a ratio of $139.47\frac{0}{0}$, as against $115.18\frac{0}{0}$ last year. Of these 4 were invalided, a ratio of $15.93\frac{0}{0}$. The loss of service was 358 days, and the daily ratio of sick $3.90\frac{0}{0}$. The average duration of treatment was 10.22 days.

The subjoined extract from the sanitary report of Surgeon T. C. Walton is very interesting, as bearing upon the quite striking diminution of the percentage of sickness as compared with the ratios of last year.

In the report of the Surgeon-General for 1879 it is stated that the percentage of sick on this vessel was greater than that of any cruising ship in the Navy, as also the number of men sent to hospital, and that these seemed to bear some relation to the humidity of the berth-deck, which was also the greatest of any cruising vessel, and was stated to be 79, while that of the spar-deck was 71.5. Care has been taken that this dampness should not exist during the present service, and the healthfulness of the crew has, no doubt, been due in some measure to that. When in the tropics during prolonged wet weather, steam was turned on the heaters frequently for a few hours during mid-day, hatches closed, and the space between decks subjected to a drying process, with apparent good effect.

The average humidity of the berth and spar decks during the year was—

	10 a. m.	4 p. m.	10 p. m.	Daily average.
At berth-deck	70. 60	69. 59	70. 65	70. 28
At spar-deck	74. 80	73. 14	86. 21	78. 05

The ship's bilges have been kept scrupulously clean. Ventilation has been properly attended to. The crew have not been unnecessarily exposed, many of their ailments being the result of accident or of imprudence while on liberty. No epidemic disease has existed on board, the most dangerous exposure to such occurring when the ship was unnecessarily at the quarantine station of Pensacola, an account of which has already been furnished the Bureau. Of the 174 admissions, 44 were for accidental injuries; there were 25 cases of malarial fever, nearly all contracted at Norfolk, and one death from the rupture of an aneurism.

The sanitary condition of the ship is excellent. If, however, she is to be used as a transport, additional accommodation for passengers should be provided, and better means for ventilation adopted than at present exist; suggestions for which were made in my last annual report.

In this connection a report by Dr Walton, addressed to Capt. A. W. Johnson, United States Navy, commander of the Powhatan, is given as embodying the sanitary means employed on the ship during her service in the West Indies.

In complying with your request that I should formulate such suggestions as have from time to time been made for the preservation of the health of the crew and the good

sanitary condition of this vessel during her recent cruise in the West Indies, I would state that the suggestions are such as the experience of many in our naval service who have preceded us in these waters has sanctioned, and the benefit we have derived has been largely due to the manner you have enforced their adoption, and the faithfulness with which your regulations have been observed.

As soon as the full effect of the change of climate between Boston and the West Indies was felt by the crew, the usual outbreak of malarious disease occurred. Five cases of remittent fever were developed, one of which proved fatal; it was exceptionally severe from the outset, and was induced by a neglect of the sanitary regulations of the ship, the man getting wet in his working suit, and remaining some time with his wet clothes on, a serious complication also setting in. Since then there have been only two cases of disease of climatic origin, both contracted by exposure to the damp night air. The only other cases of sickness on board during our ten weeks' cruise have been those which existed at the outset and the results of injury or accident.

This immunity from sickness is, of course, in a measure due to the healthy season of the year, but largely to the precautions and sanitary measures adopted, of which the following is a summary, viz:

1st. That in port the vessel be anchored as far as practicable from low or marshy land and out of the direction of winds blowing over the same. This especially applies to Port au Prince and Aspinwall.

2d. That in port the awnings be kept spread during the day, that they be triced up about two hours near sunset and the fore-castle and half of the main-deck awnings spread at night, and that when raining they all be tented.

3d. That during dry weather as many wind-sails as practicable be kept up and properly trimmed.

4th. That immediately after every hauling of fires, the ship's bilges be thoroughly cleaned, and disinfectants freely used, and that they be inspected daily.

5th. That the chains be thoroughly cleansed from mud and other sediment, on heaving in, before entering the hawse-holes.

6th. That the berth and orlop decks be wet only with warm fresh water.

7th. That all fire-wood before being received on board be barked and whitewashed.

8th. That in the event of coaling ship, coal should be brought alongside where practicable; if it be necessary to take the ship alongside a coal wharf, that she be moved away at night. That coal the most recently arrived be selected, if otherwise suitable.

9th. That as a rule all officers be required to be on board at sundown, exceptions to be made in only the healthiest ports. That they be required to wear helmets or straw hats on leaving the ship, and take umbrellas with them and use them when on shore. That they avoid undue exposure to the sun, and be temperate in their habits.

10th. That none of the crew be granted liberty, nor boats' crews be allowed to stroll from their boats without special permission from the captain. This need not apply to several of the Windward Islands, Curaçoa, and the northern ports of Jamaica.

11th. That the stewards, crew of the market-boat, and all other persons visiting the shore before breakfast, be required to drink coffee and eat something, or take a light meal before leaving the ship, and that the crews of all boats be required to use only water obtained from the ship. In case of any of a boat's crew getting wet while absent from the ship, that they change their clothing immediately after returning on board. That the officers of the watch, or of the boat, see that the instructions in this clause are carried out.

12th. That no ship's boats visit the shore later than half an hour before sunset; that their crews be protected as much as possible by awnings, and that no one be permitted to sleep on shore without special permission from the captain.

13th. That straw hats be provided for the crew.

14th. That on wet days and between 5 o'clock p. m. and 7 a. m. the crew dress in blue flannel.

15th. That on alternate days, in port, fresh meat and vegetables be provided the crew.

16th. That the bumboat be always inspected by a medical officer; that no straw or other material likely to convey contagion or vermin be allowed to be brought on board, and that no clothes from the ship be washed on shore, except in healthy ports.

17th. That the usual exercises of the crew be conducted during the morning and evening only; that the crew be protected as much as possible from the rays of the sun, rain, and dew, and that none of them be permitted to sleep on the spar-deck uncovered and from under an awning.

SARATOGA.

This vessel, one of the training ships for apprentices, spent the early part of the year in the ports of Boston and Newport. In April she

sailed on a practice cruise to Europe, and after visiting a number of ports in the Mediterranean she returned to the United States. In the latter part of the year she made a cruise to Aspinwall and Key West, returning in December to New York. During the year she was 145 days at sea and 220 in port. On board this ship there were 21 admissions for zymotic diseases and 2 were discharged to hospital. The ratios were as follows: Admission, $73.42\frac{0}{0}$; invaliding, $20.97\frac{0}{0}$; daily ratio of sick, $1.85\frac{0}{0}$. The loss of service was 196 days, and the average duration 9.36 days. There were 9 cases of simple continued fever, and but 4 of intermittent and 3 of remittent fevers. An epidemic of scarlatina occurred, 5 cases appearing, all of which were invalided at once to hospital. In the class of constitutional disorders only 13 cases were returned, yielding a ratio of $45.45\frac{0}{0}$. These were made up of 4 cases of acute rheumatism and 9 of primary syphilis. The loss of service was 331 days, and the daily average ratio of sick $3.14\frac{0}{0}$. Two cases of syphilis, $6.99\frac{0}{0}$, were invalided to hospital. The average duration of treatment was 9.16 days. There were but 2 admissions for nervous affections, 1 of dementia, which was invalided to hospital, and 1 of nausea marina. The group of respiratory diseases gave 14 cases, a ratio of $48.95\frac{0}{0}$, of which 2, a ratio of $6.99\frac{0}{0}$, were invalided. The number of sick days was 245, and the average duration of treatment 17.5 days. The daily average ratio was $2.34\frac{0}{0}$, and there was 1 death from phthisis, a ratio of $3.49\frac{0}{0}$. The principal contributing diseases were phthisis, of which there were 2 cases, and pneumonia, 3 cases. The disorders of the digestive system were remarkably unfrequent, but 12 cases, giving a ratio of $41.96\frac{0}{0}$, being reported. Of these 6 were of acute diarrhœa and 2 of acute hepatitis. The daily average ratio of sick was $1.04\frac{0}{0}$, and the loss of service, 111 days, or 9.25 for each case. Two were invalided, a ratio of $6.99\frac{0}{0}$. Genito-urinary affections comprised but 5 cases of gonorrhœa and 1 of phymosis, the latter being invalided to hospital. The ratio of admissions was $20.97\frac{0}{0}$, a very large reduction from last year, when it was $105.93\frac{0}{0}$. The loss of service was 140 days, as against 606 in 1881. Skin diseases, on the other hand, exceeded in frequency the cases reported last year, the ratios being, respectively, $132.86\frac{0}{0}$ and $80.50\frac{0}{0}$. The number of sick daily was $3.88\frac{0}{0}$, and the loss of service 406 days. These cases, $10.49\frac{0}{0}$, were invalided to hospital. There were 13 admissions from injuries, and the ratio was $45.45\frac{0}{0}$, also a large diminution from that of last year, which was $165.25\frac{0}{0}$. One case of luxatio was invalided to hospital. The ratio of daily sick was $2.76\frac{0}{0}$, and the loss of service 290 days, making the average duration of treatment 22.30 days.

ST. LOUIS.

This vessel was employed during the year as the receiving-ship at Philadelphia, with an average complement of 122 persons. From the malarious character of League Island, where this ship is stationed, the number of zymotic diseases occurring was naturally very large, 51 cases having been reported, giving a ratio of $418.03\frac{0}{0}$. Of these, 40 were of intermittent fever, 8 of vaccina, and 1 of erysipelas. Eight cases were invalided, the ratio being $64.57\frac{0}{0}$. The daily rate of sick was $4.09\frac{0}{0}$, and the loss of service 184 days, the average period of treatment having been 3.60 days. The constitutional affections contributed 10 cases, a ratio of $81.96\frac{0}{0}$, as against $29.7\frac{0}{0}$ last year. Six of the cases were of rheumatism, 2 of secondary syphilis (both being invalided), and 1 of lumbago. The daily ratio of sick was $.37\frac{0}{0}$, and the loss of service 138 days. The duration of treatment averaged 13.80 days. The invaliding

rate was $16.39\frac{0}{0}$. The class of nervous affections only contained 2 cases, 1 each of convulsio and hysteria, both of which were invalided to hospital. The respiratory group of diseases only contributed 8 cases, giving a ratio of $65.58\frac{0}{0}$, as against $29.70\frac{0}{0}$ last year. One-half these were invalided to hospital, or a ratio of $32.79\frac{0}{0}$. The loss of time was 27 days, and the average daily number sick $.57\frac{0}{0}$. The returns gave 12 cases in the digestive group, a ratio of $98.35\frac{0}{0}$, of which 4, or $32.79\frac{0}{0}$, were invalided to hospital. The number of sick daily was $.73\frac{0}{0}$, and the loss of service 34 days, making the average period of treatment 2.83 days.

The ratio furnished by 7 cases of genito-urinary diseases was $57.38\frac{0}{0}$, against $34.60\frac{0}{0}$ last year. They included one case each of albuminuria and nephritis, which were transferred to hospital, and 2 of gonorrhœa and 1 of orchitis. The daily ratio of sick was $.98\frac{0}{0}$, and the loss of service 47 days, or 6.71 days for each case. There were only 5 cases of skin disease, a ratio of $40.98\frac{0}{0}$, as against $49.70\frac{0}{0}$ last year. All were returned to duty after an average period of 11.22 days, the daily ratio of sick having been $1.22\frac{0}{0}$. The cases resulting from violence were 10 in number, furnishing a ratio of $81.96\frac{0}{0}$, a considerable diminution from that of last year, $168.31\frac{0}{0}$. They comprised 1 case of concussio cerebri, which was invalided, 2 of contusio, 3 of stremma, and 4 of vulnus, 1 of which was invalided. The ratio of sick daily from these injuries was $.73\frac{0}{0}$, and the loss of service 75 days. The invaliding ratio was $16.39\frac{0}{0}$.

STANDISH.

This small vessel, with a complement of 77 persons, was in commission for only five months, and was employed as a training vessel for naval cadets. She spent this season for the most part at the ports of Washington, Annapolis, and New York. In the zymotic class she reported 10 cases of intermittent fever, of which 2 were invalided to hospital. The ratio of admissions was $300.0\frac{0}{0}$, that of the daily sick, $7.50\frac{0}{0}$, and of the invalided, $100.0\frac{0}{0}$. In the constitutional class there was but 1 admission, a case of consecutive syphilis, which was invalided to hospital after 6 days, the ratio being $58.46\frac{0}{0}$. The affections of the digestive system were more numerous, 9 cases having been reported, with a ratio of 450.0, and a daily sick rate of $8.50\frac{0}{0}$. The average duration was 1.77 days, and the total loss of service 16 days. Resulting from injuries 4 cases of disease were reported, with a ratio of $200.0\frac{0}{0}$, and a daily sick rate of $2.50\frac{0}{0}$. One case of stremma and 1 of vulnus laceratum were invalided, making a ratio of $100.0\frac{0}{0}$. The loss of service was 19 days.

TALLAPOOSA.

This vessel has been employed during the year upon dispatch service between the various navy-yards, and having her headquarters at Washington. Her complement averaged 125 persons. In the zymotic class of diseases, 40 reported cases give the large ratio of $320.0\frac{0}{0}$, due chiefly to the prevalence of intermittent fever, of which there were 28 cases, a number in excess of that of any other ship except the Franklin. Three cases of epidemic catarrh were also reported, 29 remittent fever, and 4 of vaccina. The daily sick rate was $3.92\frac{0}{0}$, and the loss of service 181 days, making the average duration of treatment 4.41 days. Three cases, or $24.0\frac{0}{0}$, were invalided to hospital. There were returned 37 cases of constitutional affections, giving a ratio of $296.0\frac{0}{0}$, as against

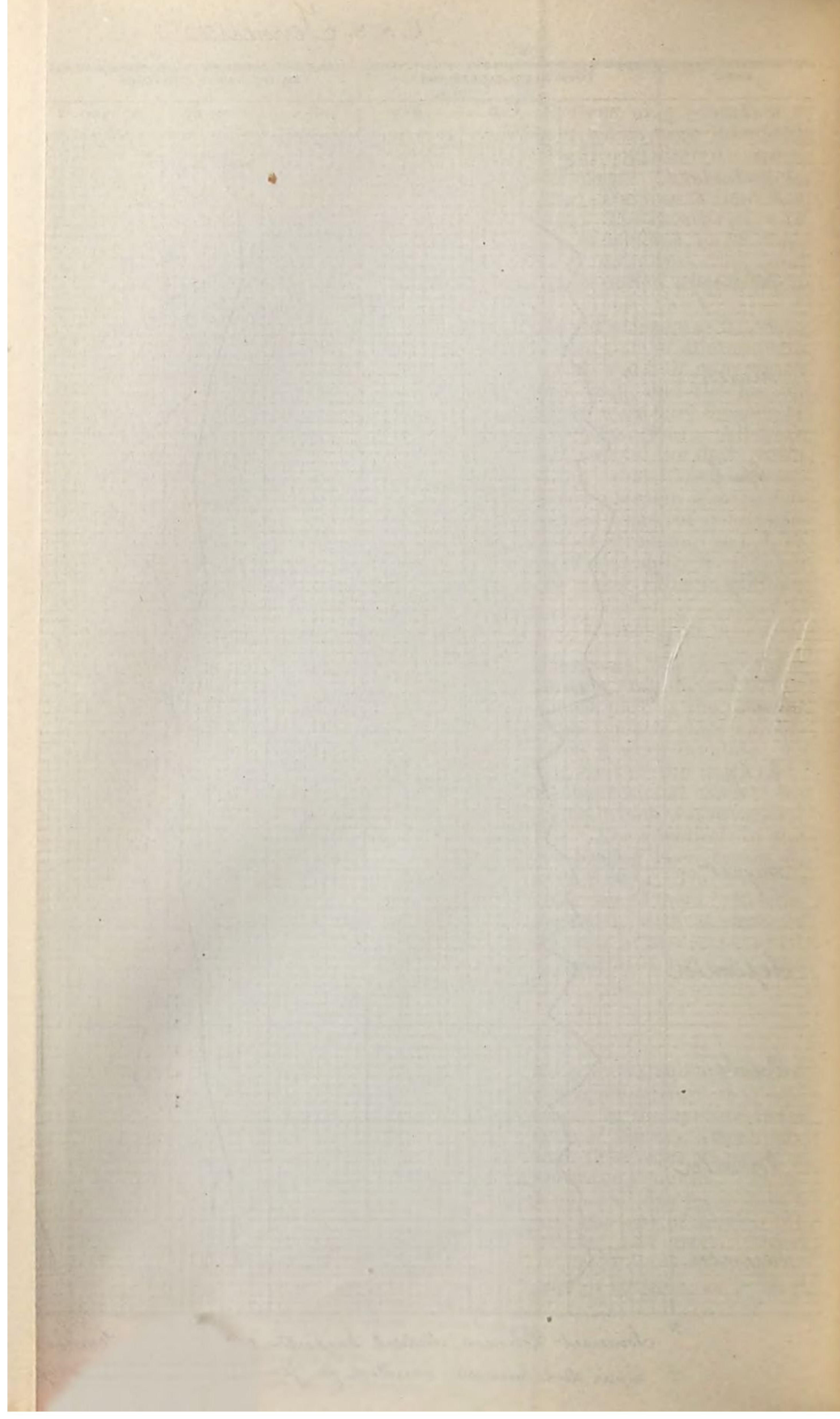
U. S. S. Tennessee

J. H. Gaines

P. A., Surgeon.*

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											510	9.4	3	13	30	Long Yard New York
February											508	14.8	7.4	9	28	New York to 7th Hampton Roads from 11
March											503	24	22.3	7	31	Hampton Roads 1 New Orleans 12 to 28
April											498	21.5	18.9	12	30	Port Royal, S.C. 3 to 20 Hampton Roads from 23
May											480	19.6	15.2	8	22	Hampton Roads to 9 and 30 & 31
June											465	24.4	23.8	5	24	Hampton Roads to 16 New York from 22
July											460	24.1	26.3	4	30	New York to 11 Provincetown, Mass. 14 to 28
August											456	21.1	20.8	4	29	Boston 2 to 8 Portsmouth 12 to 22 Portland, Me. from 27
September											441	20.1	18	8	28	Portland, Me. 1 Eastport, Me. 7 Bar Harbor, Me. 10 & 11 Portsmouth 13 to 19 New York from 28
October											441	19.9	17.6	8	28	New York to 18 Philadelphia 21 to 28 Hampton Roads 31
November											451	16.9	11.6	1	24	Hampton Roads
December											458	19.8	14.6	3	29	Hampton Roads to 15 Martinique, W.I. from 29

* Somerset Robinson, Medical Inspector, 2^d quarter. Thomas H. Leach, Medical Inspector, from July
 + Spar deck humidity omitted for January on account of minus temperature much of month



171.71 $\frac{0}{00}$ last year. The cases comprised 5 of adynamia, of which 2 were invalided, 22 of rheumatismus, 10 invalided, and 10 of syphilis, 4 being invalided. The daily sick rate was .80 $\frac{0}{00}$, and the loss of service 292 days, an average of 7.89 for each case. The invaliding rate was 128.0 $\frac{0}{00}$. In the group of nervous affections there are returned 11 cases, a ratio of 88.0 $\frac{0}{00}$, and a daily ratio of 1.04 $\frac{0}{00}$. The loss of service was 51 days, an average duration of 4.63 days. One case of dementia (8.0 $\frac{0}{00}$) was invalided to hospital. The class of respiratory diseases yielded 5 cases, comprising one of asthma, invalided; 2 of bronchitis acuta, and 1 each of phthisis and pleuritis, which were invalided. The ratios were as follows: Admission, 40.0 $\frac{0}{00}$; daily sick, 1.52 $\frac{0}{00}$; invaliding, 24.0 $\frac{0}{00}$. The loss of service was 70 days, and the average duration of treatment 14 days. There were reported 24 cases under the head of diseases of the digestive system, which gave a ratio of 192.0 $\frac{0}{00}$, a large falling off from that of last year, which was 404.04 $\frac{0}{00}$. The ruling disorders were diarrhœa, 9 cases, of which 1 was invalided, and colic and tonsillitis, of each 6. The daily sick-rate was 1.92 $\frac{0}{00}$, and the loss of service 90 days. The average duration of treatment was 3.75 days. The genito-urinary cases numbered 7, a ratio of 56.0 $\frac{0}{00}$, as against 50.50 $\frac{0}{00}$ last year. They comprised 5 of gonorrhœa and 1 each of chancroides and orchitis. All recovered on board, with an average loss of service of 7 days, or 49 in all. Twenty-one cases of skin disease were reported, a ratio of 168.0 $\frac{0}{00}$, as against 121.21 $\frac{0}{00}$ last year, with only 1 invalided, a case of eczema. The daily sick rate was 3.28 $\frac{0}{00}$ and the loss of service was 150 days, or 7.14 for each case. The cases resulting from injuries amounted to 36, a ratio of 288.0 $\frac{0}{00}$, as against 373.73 $\frac{0}{00}$ last year. The only case invalided was 1 of stremma. The loss in time was 203 days and the average duration of treatment 5.63 days. The daily rate of sick from these cases was 3.40 $\frac{0}{00}$, and the invaliding rate was 8. A death from drowning occurred, giving the same ratio.

TENNESSEE.

This vessel, the flag-ship of the North Atlantic squadron, had an average complement of 471 persons. In the first quarter of the year she made a cruise to New Orleans, where she remained nearly a month. Returning to Hampton Roads in the second quarter, she spent the remainder of the year in cruising along the coast as far east as Eastport, Me. Towards the close of the year, she commenced a cruise to the West Indies, where she was engaged at its close. She was at sea during the year 93 days, and in port 272 days. There was a total of 33 cases in the class of zymotic affections, giving a ratio of 70.06 $\frac{0}{00}$, an increase over that of last year, which was 42.35 $\frac{0}{00}$. They included 14 cases of febris intermittens, 1 death occurring; 2 of febris enterica, of which 1 was invalided, as was 1 case of morbilli. Varioloides appeared on board, but with the prompt transfer of the 3 cases which appeared, together with revaccination of the crew, the epidemic did not extend. The daily ratio of sickness was 1.65 $\frac{0}{00}$, and the loss of service 287 days, making an average duration of treatment 8.09 days. The invaliding rate was 20.97 $\frac{0}{00}$, and the death rate 2.12 $\frac{0}{00}$. There were returned 42 cases of constitutional affections, yielding a ratio of 89.17 $\frac{0}{00}$, a considerable reduction from that of last year, which was 108.73 $\frac{0}{00}$. The leading affections were adynamia 5 cases, lumbago and podaga, of each 3, rheumatismus 10, syphilis 23. Six cases, a ratio of 12.73, were invalided to hospital. The daily sick rate was 2.33 $\frac{0}{00}$, and the loss of service 405 days. Nervous diseases contributed 12 cases, and a ratio of 25.47 $\frac{0}{00}$,

among which were 3 cases, respectively, of epilepsy, hysteria, and melancholia, 2 of the latter being invalided. The daily ratio of sick from these affections was $.53\frac{0}{100}$, the loss of service 94 days, and the average duration of treatment 7.83 days. The invaliding rate was $4.24\frac{0}{100}$. The ratio contributed by 60 cases of diseases of the respiratory organs was $127.38\frac{0}{100}$, almost precisely that of last year, which was $127.05\frac{0}{100}$. The cases were mostly catarrhal, 45 cases, and there were 9 of bronchitis, 1 of hæmoptysis, which was invalided, and 4 of pneumonia, of which 3 were invalided. The daily number of sick was $2.01\frac{0}{100}$, the loss of service 349 days, and the average duration of treatment 5.81 days. Four were invalided, making the ratio $8.49\frac{0}{100}$. Diseases of the digestive system gave 40 cases, a ratio of $93.41\frac{0}{100}$, as against $168.23\frac{0}{100}$ last year, the chief factors being diarrhœa 18 cases, and tonsillitis 9 cases. The daily rate of sick was $2.03\frac{0}{100}$, and the total number of sick days 351. The average duration of treatment was 7.97 days, and there were 3 cases, or $6.37\frac{0}{100}$, invalided to hospital. The genito-urinary affections numbered 31 cases, a ratio of $65.82\frac{0}{100}$, as against $44.70\frac{0}{100}$ last year. They comprised 15 cases of chancroides, 6 of gonorrhœa, and 5 of orchitis. Of the 2 cases of strictura urethra, 1 was invalided, as was a single case of dysuria. The daily ratio of sick from these affections was $1.14\frac{0}{100}$, and the number of sick days 198, giving an average duration of treatment 6.38 days. Three cases were invalided, a ratio of $6.37\frac{0}{100}$. There were 31 cases of skin disease, giving a ratio of $65.82\frac{0}{100}$ for admission, and a daily sick rate of $1.95\frac{0}{100}$. The ratio shows a marked increase over that of last year, which was $49.41\frac{0}{100}$. The time lost was 338 days, and the average duration of treatment 10.10 days. One case of abscessus was invalided, a ratio of $2.12\frac{0}{100}$. There were reported 56 cases of disease resulting from injury, with a ratio of 118.89, as against $101.17\frac{0}{100}$ last year. The ratio of sick, daily, was $3.94\frac{0}{100}$, and the loss of .684 days, making the average duration of treatment 12.17 days. Three men, a ratio of $6.87\frac{0}{100}$, were invalided to hospital, and there was 1 death ($2.12\frac{0}{100}$) from drowning.

VANDALIA.

The opening of the year found this ship in the West Indies, where she visited a number of ports, and then returned north; remained nearly 2 months at Port Royal on the way north. During the third quarter she remained at Portsmouth, N. H., and from thence she returned to the West Indies, where she was at the close of the year. During the year she was in port 281 days, and 84 at sea. Her complement averaged 195 persons. In the zymotic class of diseases there were reported but 7 cases of intermittent fever and 2 of vaccina, making the small ratio of $41.02\frac{0}{100}$, as against $30.70\frac{0}{100}$ last year. The daily ratio of sick was $40\frac{0}{100}$, the loss of service 110 days, and the average duration of treatment 13.75 days. The constitutional affections afforded 16 cases, a ratio of $82.05\frac{0}{100}$, as against $100.87\frac{0}{100}$ last year, and a daily sick rate of $1.53\frac{0}{100}$. The loss of service was 112 days, and the average duration of treatment 7 days. Two cases of syphilis, 1 of rheumatismus and 1 of lumbago were invalided, a ratio of $20.51\frac{0}{100}$. The nervous affections reported were 9 in number, giving a ratio of $46.15\frac{0}{100}$, as against $39.47\frac{0}{100}$ last year. These comprised 2 cases each of pleurodynia, neuralgia, and cephalalgia, one of the latter being invalided, as were the single cases of epilepsy, dementia, and melancholia. The daily sick ratio was $92\frac{0}{100}$ and the loss of service 68 days; 4 cases, a ratio of $40.51\frac{0}{100}$, were invalided. Fifteen cases of respiratory affections occurred, a ratio of $76.93\frac{0}{100}$, as against $39.47\frac{0}{100}$ last year. The 4 cases of bronchitis chronica, and the

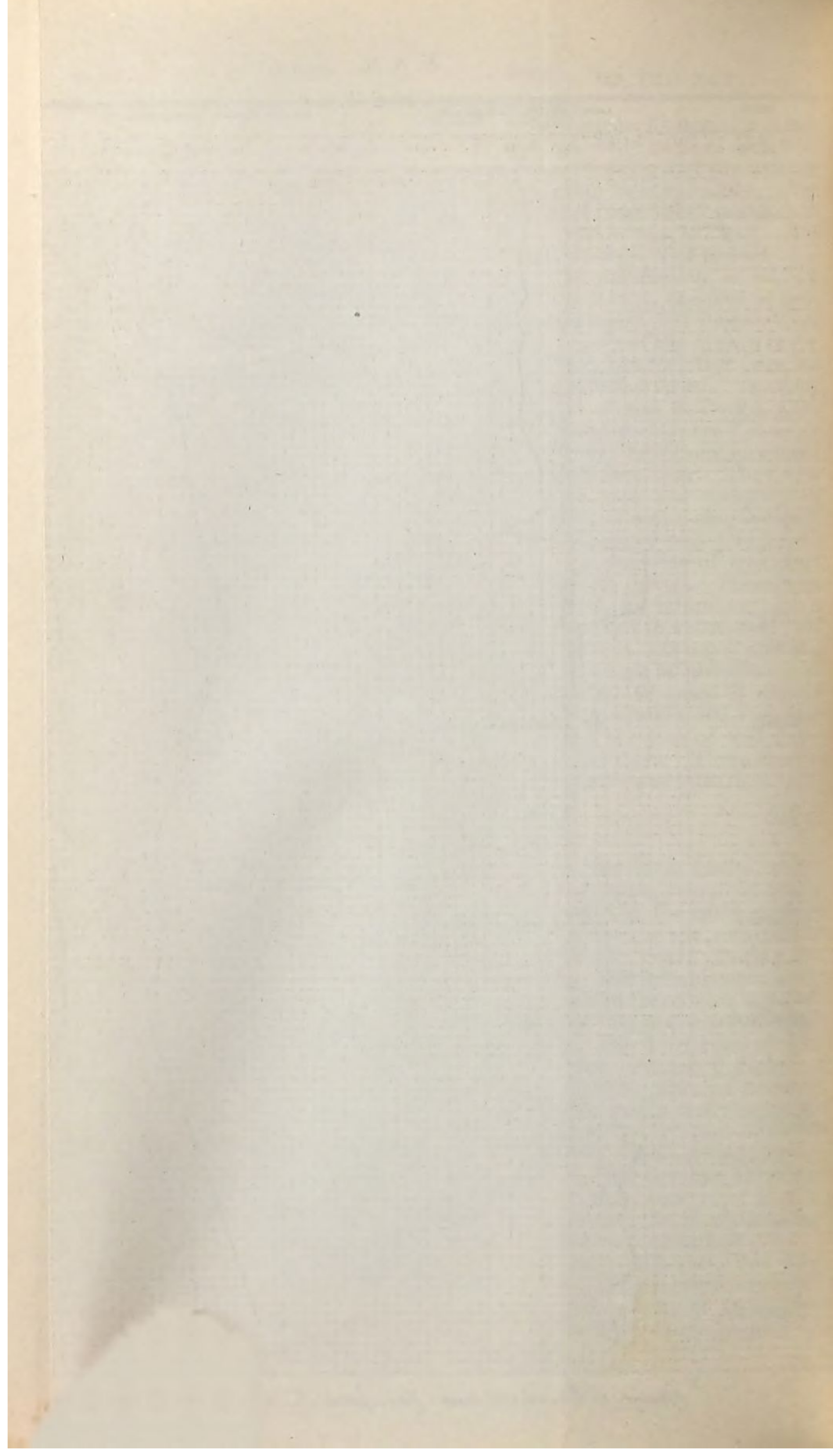
U. S. S. *Vandalia**George F. Winslow*

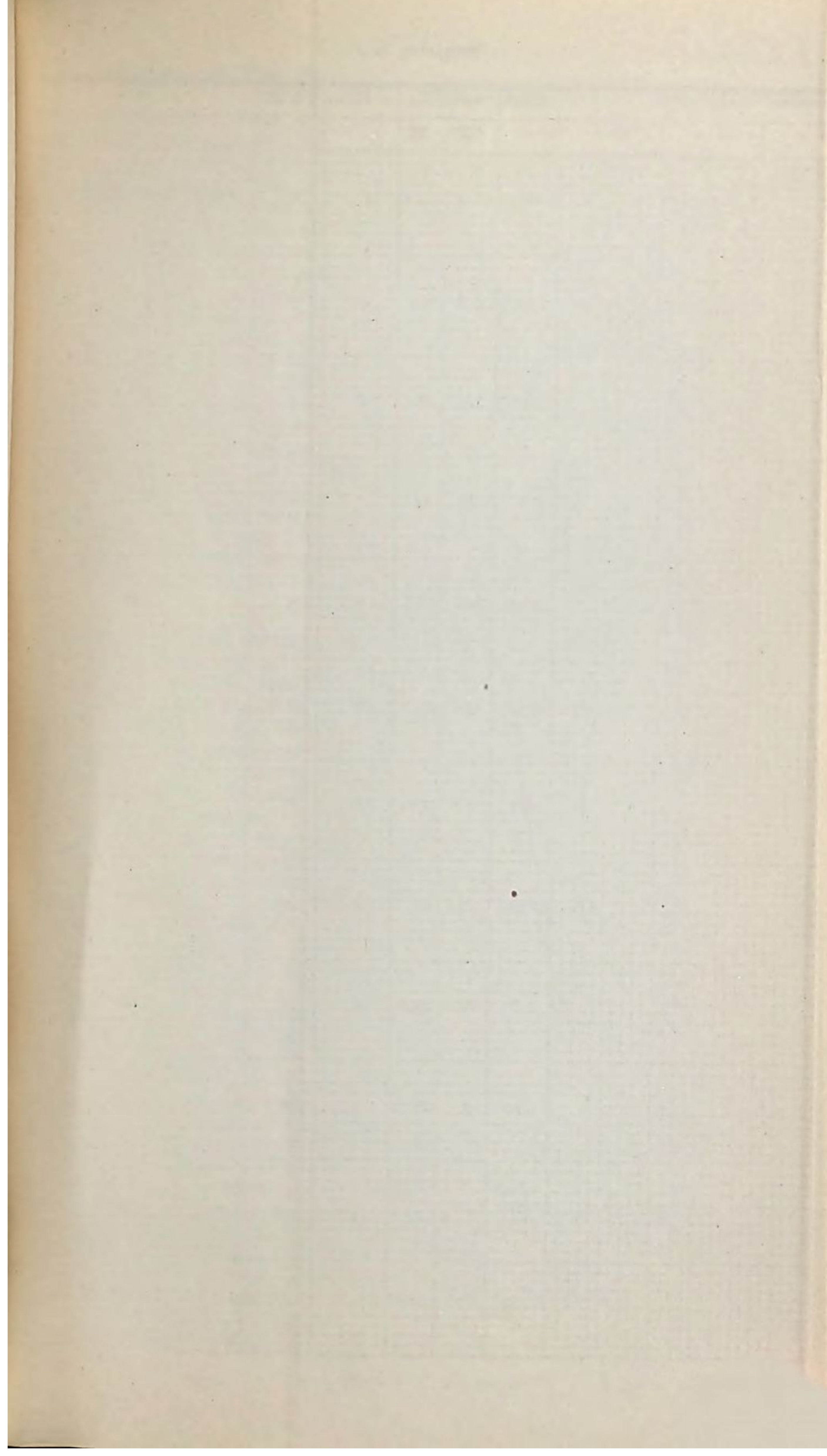
*, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.	
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Star-deck.				
1882																	
January											201	28	25.1	1	3	Mount Serrat 394 St. Pierre 6 to 9 Grenada 12 to 16 Trinidad 17 to 22 Curacao 27 to 30	
February											197	28	25.8	1	4	Savannah 49.5 Gentofte 7 to 11 Aspinwall	
March											201	25.6	23.9	2	3	Havana 1 to 9 Key West 10 to 20 Port Royal 28 to 31	
April											185	20.3	17.2	8	3	Port Royal 1 to 15 Hampton Roads 18 to 30	
May											176	21.3	15	4	3	Hampton Roads 1 to 4 Norfolk 5 to 8 Hampton Roads 27 to 30	
June	No observations										190	23.4	21.4	2	5	Norfolk to 10 Hampton Roads 11 to 16 Portsmouth, N. H. from 23	
July		do.									+	190	22.1	21.5	4	5	Portsmouth
August		do.									190	21.6	21	2	5	do.	
September		do.									204	19.3	17.3	9	5	do.	
October											195	22.6	17	7	5	Portsmouth to 5 Hampton Roads 9 to 15 Lynn Haven Bay 24 to 25 League Island 28 Philadelphia 29 to 31 Chester 1 Cape Henlopen 3 Hampton Roads 4 to 27 Delaware Break Water 30	
November											205	19	10.6	3	7	Hampton Roads 2 to 12 Norfolk 13 to 14 Hampton Roads 15 St. Thomas, W. I. from 29	
December											215	23	13.3	3	11		

* George D. B.

* George R. Boush, Surgeon from June. † Ship's company removed to the "Guard" ‡ Ship's company returned to the "Vandalia".





U. S. S. *Habash**J. H. Clark*

, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
<i>January</i>											300	+	?	6	6	<i>Navy Yard, Boston</i>
<i>February</i>											300	+		6	4	<i>do.</i>
<i>March</i>											300	+		5	4	<i>do.</i>
<i>April</i>											225	20	18	1	2	<i>do.</i>
<i>May</i>											250	20.6	18.6	6	3	<i>do.</i>
<i>June</i>											275	21.6	21.3	0	5	<i>do.</i>
<i>July</i>											200	24	24.6	1	5	<i>do.</i>
<i>August</i>											170	22.6	23	0	4	<i>do.</i>
<i>September</i>											170	20.6	20.6	6	5	<i>do.</i>
<i>October</i>											150	19	21	3	4	<i>do.</i>
<i>November</i>											150	17.6	23	3	4	<i>do.</i>
<i>December</i>											150	17	21.6	3	5	<i>do.</i>

* B. H. Kidder, Surgeon from April. + Steam heat. ? Spar deck roofed over.

2 cases of phthisis which occurred were invalided to hospital. There was a daily ratio sick of $2.92\frac{0}{0}$, a loss of 210 sick days, and an average duration of treatment of 14 days. The invaliding rate contributed by 6 cases was $30.76\frac{0}{0}$. The ratio of admissions from the 27 cases of affections of the digestive system was $138.46\frac{0}{0}$, a very marked increase over that of last year, which was $35.08\frac{0}{0}$. Single cases of hernia, hæmorrhoids, fistula in ano, and dyspepsia were invalided, the ratio being $20.51\frac{0}{0}$. The ratio of sick daily was $1.84\frac{0}{0}$, and the total number of sick days 135, giving 5 days as the average duration of treatment. The genito-urinary class of diseases gave only 4 cases, of which 2 were of urethral stricture, both invalided, and 1 each of gonorrhœa and orchitis. The ratio of admission was $20.51\frac{0}{0}$, as against $39.47\frac{0}{0}$ last year, and the loss of service was 27 days. The invaliding rate was $10.25\frac{0}{0}$. There were 7 cases of skin disease, a ratio of $38.89\frac{0}{0}$, as against $17.34\frac{0}{0}$ last year, giving a daily ratio of $1.23\frac{0}{0}$. The cases comprised were 3 each of furunculus and ulcer, and 1 of pemphigus. The loss of service was 90 days, and the average duration of treatment $12.85\frac{0}{0}$. Diseases resulting from violence were 21 in number, and the ratio was $107.68\frac{0}{0}$, as against $87.71\frac{0}{0}$ last year. One case of ambustio and 1 of fractura were invalided. The daily sick rate was $2.05\frac{0}{0}$, and the total loss of service 146 days, the average duration having been 6.95 days. The 2 cases invalided gave a ratio of $10.75\frac{0}{0}$.

WABASH.

This vessel served as the receiving ship at Boston during the year, and had a complement of 119 men. In the class of zymotic affections 5 cases were reported, giving a ratio of $42.01\frac{0}{0}$, of which 3 were intermittent fever, and 1 each of remittent fever and typhoid fever, both of which were invalided. The daily ratio of sick was .25, the loss of service 11 days, and the invaliding ratio $16.80\frac{0}{0}$. The class of constitutional affections contributed 18 cases, and a ratio of $151.26\frac{0}{0}$, as against $96.96\frac{0}{0}$ last year. The daily rate of sick was $1.26\frac{0}{0}$, the total number of sick days 55, and the average duration of treatment 3.05 days. Six cases of syphilis, 3 of adynamia, and 1 each of rheumatism and carcinoma were invalided, making the ratio $92.43\frac{0}{0}$. Eight cases fell under the head of nervous affections, giving a ratio of $67.22\frac{0}{0}$, and a daily sick ratio of $.75\frac{0}{0}$. Single cases of dementia, mania, and paralysis occurred, which were invalided. The loss of service was 35 days, and the invaliding rate $25.20\frac{0}{0}$. Of affections of the respiratory organs there were 10 cases, giving a ratio of $84.03\frac{0}{0}$, as against $48.48\frac{0}{0}$ last year. The daily sick rate was $1.59\frac{0}{0}$, and the loss of service 72 days. There were invalided 1 case of acute bronchitis, and 1 of phthisis, making the ratio $16.80\frac{0}{0}$. The cases falling under the head of digestive system were 13, giving a ratio of $118.18\frac{0}{0}$, an increase over that of last year of $78.77\frac{0}{0}$. There were invalided single cases of peritonitis, fistula in ano, and tonsillitis, giving a ratio of $25.70\frac{0}{0}$. The daily sick ratio was $1.34\frac{0}{0}$, the total loss of time 27 days, and the average duration of treatment 2.07 days. The genito-urinary system gave only 2 cases, 1 of albuminuria, invalided, and 1 of varicocele. The ratio was $16.80\frac{0}{0}$ as against $18.88\frac{0}{0}$ last year. Three cases of furunculus and 1 of ulcer (which was invalided) made the total of skin diseases for the year. The ratio was $33.61\frac{0}{0}$, as against $42.42\frac{0}{0}$ last year, and the loss of time was 42 days. Diseases resulting from injuries numbered 15, giving a ratio of $126.05\frac{0}{0}$ as against $66.66\frac{0}{0}$ last year. The invalided were 2 cases of fracture, making a ratio of $16.80\frac{0}{0}$. The loss of time amounted to 98 days, and the daily average sick rate was $2.18\frac{0}{0}$, while the average duration of treatment was 6.53 days.

WYANDOTTE.

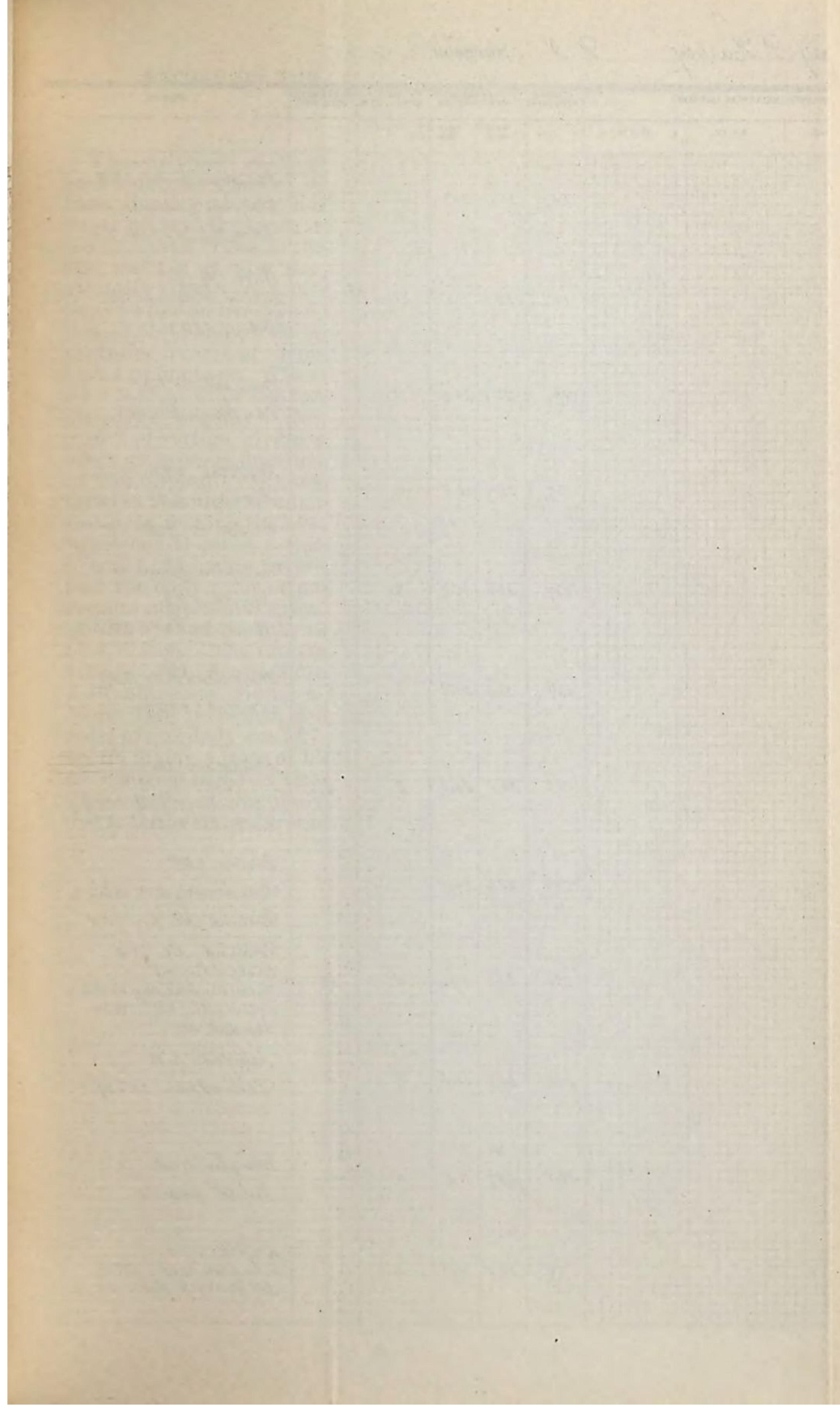
This iron-clad remained at Washington during the year, serving as receiving ship, with a complement of 68 men. The zymotic cases were composed entirely of intermittent fever, of which there were 13, 9 of whom were invalided to hospital. The ratio furnished was $191.17\frac{0}{0}$, and the daily ratio was $1.01\frac{0}{0}$. The loss of service was 26 days, and the average duration of disease 2 days. Three cases of syphilis were reported under the head of constitutional diseases, of which 1 was invalided to hospital. The ratios, respectively, were $44.11\frac{0}{0}$ and $14.70\frac{0}{0}$. The classes of nervous and respiratory organs each contributed 1 case, ratio $14.70\frac{0}{0}$, and 2 cases of tonsillitis occurred among diseases of the digestive organs. There was 1 injury, vulnus sclopetarium, which was invalided without delay to hospital.

• The following extract is from the report of Passed Assistant Surgeon R. C. Persons :

I desire to call particular attention to the water used for drinking. It is obtained from the hydrants on shore, and as they are situated at the ends of the city mains, the greater part of the detritus in the mains finds its way to the terminal hydrants. The tanks are thoroughly cleaned and the water is taken on board in the usual manner, through a hose, care being taken to allow that first passing through to flow overboard. The water is found objectionable and there is complaint among the men, many of whom state they prefer the water taken from the river alongside. As there are sewer mains opening into the river both above and below the ship, and the tide is continually washing the discharge one way or the other, orders have been passed forbidding its use. Filtering renders the water from the hydrants perfectly potable, and I recommend that a filter of sufficient capacity for general use be furnished this vessel.

WYOMING.

This vessel served as receiving and store ship for the naval station at Port Royal, S. C., with a complement of 120 persons. Zymotic diseases were represented by 9 cases of intermittent and 3 of remittent fever, and 3 of vaccina. The ratio for the 15 cases was $136.36\frac{0}{0}$, and of the daily sick $1.99\frac{0}{0}$. The cases recovered on board, after an average duration of 4.8 days, the total loss of service amounting to 72 days. Constitutional diseases gave 12 cases, a ratio of $109.09\frac{0}{0}$ as against $83.33\frac{0}{0}$ last year. There were 7 of syphilis, 3 of rheumatism, and 2 of lumbago. All recovered after an average treatment of 12.66 days, and the total loss was 152 days. The diseases of the respiratory system were only three in number, which were mostly catarrhal and not severe. The ratio was $27.27\frac{0}{0}$ as against $33.33\frac{0}{0}$ last year. Diseases of the digestive system contributed 13 cases, of which the principal factors were, colica, 3; cholera morbus, 4; congestio hepatis, 2; and tonsillitis, 2. The ratio was $118.18\frac{0}{0}$ as against $183.33\frac{0}{0}$ last year. The loss of time was 27 days, making the average period of treatment 2.07 days. The diseases of the genito-urinary system were 2 each of gonorrhoea and orchitis; the ratio given being $36.36\frac{0}{0}$, nearly the same as that of 1881, $33.33\frac{0}{0}$. The loss of time was 51 days, and the average duration 12.75 days. There were over 7 cases of skin diseases, a ratio of $63.63\frac{0}{0}$, as against $83.33\frac{0}{0}$ last year. The loss of service was 58 days, and all the cases returned to duty after an average duration of 8.28 days. The class most largely represented was that of diseases from injuries, which contributed 22 cases, or $200.0\frac{0}{0}$ as against $150.0\frac{0}{0}$ last year. They returned to duty after an average of 4.45 days' treatment, the total loss having been 98 days. The daily rate of sick was $2.79\frac{0}{0}$ as against $1.06\frac{0}{0}$ last year.



U. S. S. Yantic

Henry P. Harvey

P. A., Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spa-deck.			
1882																
January											147	25.7	26.6	0	4	And Cayes, Hayti 3 to 9 Kingston, Jamaica 11 to 15 Colon, W. S. Col. from 24
February											147	28	26.5	1	4	Colon to 14 Quatan, Honduras 22 Belize 23 to 26
March											139	25.5	23.2	0	0	Pensacola 5 to 21 Vera Cruz 22 to 25
April											139	22.7	18.5	7	4	Key West 5 to 6 Port Royal, S. B. 9 to 15 St. Monroe from 19
May											137	21.6	15.2	2	4	Hampton Roads to 5 Norfolk 6 to 8 Hampton Roads 9 to 31
June											139	23.2	21.8	1	3	Hampton Roads to 17 New York 23 to 29
July											140	24.1	20.8	0	8	Danvers, Me 3 to 7 Fort Point, Me 8 to 11 Provincetown, Mass. 13 to 27 Boston 28 & 29
August											144	22.4	19.7	1	5	Boston 2 to 8 Portsmouth, N. H. 13 to 23 Portland, Me from 29
September											138	22	17	5	5	Portland, Me. 14 to 2 Eastport 7 to 8 Frenchman's Bay, N. H. 13 to 20 Portsmouth, N. H. 13 to 20 New York 30.
October											140	21.9	16.6	8	5	New York to 18 Philadelphia 21 to 29
November											145	17.7	11.2	5	6	Hampton Roads 1 Norfolk from 2
December											150	20.5	13.2	6	7	Norfolk to 5 Hampton Roads 6 to 16 St. Vincent, W. I. 31

* Steam heat from Nov. 26 to Dec 17.

YANTIC.

The early part of the year was spent by this ship in the West Indies, and along the coast of Mexico, from whence she returned to Key West, Port Royal, and New York. In the third quarter she sailed along the coast of New England, returning to Hampton Roads, from whence she made a short cruise to the West Indies and returning. During the year she was 110 days at sea and 255 in port. The cases included in the zymotic class were 6 of intermittent fever, all of which recovered on board after an average duration of 4 days, the ratio of admissions being $42.55\frac{0}{0}$, and of the daily sick, $.42\frac{0}{0}$. The constitutional affections included 5 cases of rheumatism, 4 of syphilis (of which 1 was invalided), and 4 of lumbago. The ratio of admissions was $78.01\frac{0}{0}$, and of the daily sick $2.48\frac{0}{0}$, while the loss of service was 128 days, making the average duration 11.63 days. Nervous affections included 3 cases of neuralgia and 1 of vertigo, giving a ratio of $88.0\frac{0}{0}$. These were returned to duty after an average duration of 8.5 days. There were 4 cases of diseases of the respiratory organs, of which 1, a case of hæmoptysis, was invalided. The ratio of admissions was $28.36\frac{0}{0}$, and there were 11 days of sickness, making the average duration 2.45 days. The digestive class furnished 11 cases, a ratio of $78.01\frac{0}{0}$ as against $179.31\frac{0}{0}$ last year, and 2, or $14.18\frac{0}{0}$, were invalided to hospital. The time lost was 60 days, and the daily ratio of patients $1.13\frac{0}{0}$. Diseases of the genito-urinary organs comprised 8 cases, 2 of chancroides, 3 of gonorrhœa, and 1 each of orchitis and paraphymosis. All recovered after an average duration of 9.37 days. The ratio for admissions was $56.72\frac{0}{0}$, and of the daily sick $1.40\frac{0}{0}$. Skin diseases furnished 10 cases of furunculus, 2 of ulcer, and 1 of abscessus, giving a ratio of $92.19\frac{0}{0}$ as against $83.33\frac{0}{0}$ last year. None were invalided, and the total loss of service was 67 days. The ratio of sick daily was $1.27\frac{0}{0}$. Diseases resulting from injuries amounted to 19, giving a ratio of $134.75\frac{0}{0}$ as against $156.0\frac{0}{0}$ last year. One case of contusio and 1 of stremma were invalided, the ratio being $16.80\frac{0}{0}$. The number of sick daily was $1.98\frac{0}{0}$, and the loss of service was 103 days, the average duration of treatment having been 5.42 days.

MEDICAL TOPOGRAPHY AND SANITARY REPORTS.

REPORT OF SURGEON T. C. WALTON.

U. S. S. POWHATAN.

San Juan de Porto Rico was visited in February. About 20,000 people live within its walls. It is built on the slope of a hill. Most of its streets are paved with cobble-stones, with drains running through their middle to carry off the rain-water into the harbor. There is no sewerage; pits are chiefly used for water-closets and garbage; they are emptied by means of open carts, and the refuse taken into the country. Rain-water collected in cisterns and filtered is only used. The habitations of the poor are much crowded, sometimes 300 people living in a single building, and ventilation among them is unknown. The town is generally healthy, owing to the frequent rains and the sea breeze. Three years ago small-pox prevailed epidemically, and about one-sixth of the people met in the streets seem to be marked by it.

A visit was made to the military hospital of San Juan. All parts of it were cheerfully shown by the director in charge. It is located in a building that was formerly a monastery, situated on the most elevated part of the town, and is fairly adapted for its present purpose, being cool and well ventilated and having accommodations for 300 patients. It is intended for the military stationed in San Juan and the surrounding district, and also provides about 60 beds for the poor of the town—men only. Its staff consists of a medical officer with the rank of colonel, who has entire charge, and is responsible to the governor of the island only; a director (lieutenant-colonel) and four assistants (captains); an officer of the line, detailed from the barracks for police duty, under the director; and 40 soldiers specially selected and detailed for hospital duty, to act as nurses, guards, &c.; there are also 40 Sisters of Charity, who have charge, under the director, of the preparation of food, bedding, clothing, &c. The wards generally are very large, containing about 40 beds each; a few smaller ones contain 4 beds each and are intended for officers.

Contagious diseases are treated in wards as much isolated as possible, and disinfectants freely used. At the side of each bed in all the wards is a wooden close-stool containing an ordinary *pot de chambre*, which when used are required to be immediately cleansed, so that there is no perceptible odor. At the time of my visit, February 14, there were 137 inmates, 96 military and 41 civil. The latter were in a ward on the ground floor, somewhat darker and not in so good repair as the others; the director, however, hoped soon to have means to improve it. Among the military were 29 cases of malarial fever, chiefly intermittent; 31 of venereal disease; 8 of ulcer; 4 of chest affections, and 2 of diarrhœa; a fair illustration of the nature and ratio of sickness among the troops at that season, numbering about 2,000 men, chiefly infantry. The diet table of the hospital was very generous, and liberal additions were

allowed whenever necessary, the director priding himself on the benefits resulting therefrom. A large supply of surgical instruments and appliances had quite recently been received from Paris, embracing most of the recent modifications and inventions. The library was also supplied with the principal European medical periodicals and publications. The entire management seemed to be extremely liberal and intelligent, and was highly creditable to the spirit that dictated it. Sick sailors from our national vessels would be received in this hospital, without charge, on application to the governor. Officers would be charged about one dollar per diem. In San Juan there is a small hospital for women; a larger one is being erected outside of the town; there is also a general hospital and a public school.

Frederickstadt, Santa Cruz, was visited February 24, 18 days after leaving Norfolk. Quarantine was established against the United States on account of small-pox; an absence from there of 14 days and freedom from the disease was required before pratique was granted, then all clothing and other material likely to convey contagion was fumigated on landing, before entering the town. In the case of this vessel, soiled clothes for the laundry were placed in a closed box at the landing and exposed to chlorine vapor for two hours. There had not been a case of small-pox on the island since 1875; nor of yellow fever since 1879. Intermittent fever was quite prevalent; elephantiasis and frambœsia existed to a limited extent among the negroes.

There is a hospital at Frederickstadt in charge of a "king's physician," which has about 60 beds; it is poorly equipped, but afforded shelter, food, and medical attendance for its inmates. The "king's physician" was also health-officer of the port and physician for the poor of the district. For these services he received about \$1,000 per annum, and was required to provide his own instruments. Medicines are furnished at the state expense by an apothecary in the town, on the physician's prescription. A force of 30 soldiers is stationed at the fort, in Frederickstadt, out of which there had been 14 admissions monthly to the hospital during the past year, two-thirds of them being cases of intermittent fever. That disease seemed to be equally prevalent at all seasons. Persons in our Navy have been treated in this hospital, but it is not advisable to send patients there without amply providing for their comfort and attendance.

Basse Terre, Guadeloupe, was visited March 3. It has a civil and military hospital; and 7 miles distant, on an elevated plateau, is a hospital for convalescent and chronic cases. There were a few cases of yellow fever in the town about eight months previously. Malarial fevers were quite prevalent, particularly at Point à Pitre, the commercial port of the island. Basse Terre is the seat of government, and most of the troops, about 1,000, are stationed there. The population of Guadeloupe is about 27,000, less than 1,500 of whom are whites. Elephantiasis is quite prevalent among the negroes; frambœsia less so than on the neighboring islands.

Dominica, the next island called at, is one of the most beautiful in the West Indies. Its annual rainfall ranges from 180 to 240 inches, and its temperature from 65° to 90° Fah.; hence its verdure. In March, 1881, according to the census report, it had a population of 28,211; 12,867 males, 15,344 females; 361 whites, 6,814 colored, and 21,036 blacks. During the decade the increase of the males was 1.02 per cent., while that of the females was 6.25 per cent. This was owing to the large emigration of men to Venezuela. The same report states that there are 502 infirm people on the island, 238 of them afflicted with frambœsia; the

disease being about equally divided as to sex. The religious denominational classification is 25,000 Roman Catholics, 2,200 Wesleyans, and 800 Anglicans. The civil condition is 16,300 married, 20,400 unmarried, 1,200 widows, and 300 widowers. 12,000 are engaged in agriculture, 1,150 as domestic servants, 600 as petty cultivators, 100 as planters, 50 as overseers, 400 in commerce, 50 as mariners, 30 as school-teachers, and 18 nuns. There are 2,400 scholars, 86 paupers, and 26 prisoners. Also on the island are 309 Caribs, or aborigines; of these 136 are described as being of mixed breed, and their number is increasing, though they all live on a reservation several miles apart from the other inhabitants. The Caribs are exempt from the ordinary regulations of the island, but are required to keep the roads throughout their reservation in repair, and these roads are said to be the best on the island. These people are under the control of a chief, and are described as industrious and hospitable. They are short in stature, but of good physique, resembling somewhat the East Indian coolie, but much stouter, and with higher cheek-bones.

In Dominica laborers are engaged by the week, and are required to perform five days' work or receive no pay. They are usually plentiful. The island is divided into districts. A magistrate, physician, and constables are appointed to each, though their duties may extend over several. Usually there are five physicians on the island. They are appointed by the colonial secretary in England, and are under the direction of the president of the island, who represents the Crown. They receive about 250 pounds sterling per annum from the Government, and are required to attend the poor of their districts and the various Government institutions, and are allowed to charge those able to pay two shillings for an office visit and three shillings for a domiciliary one, the more opulent of their patients being expected to pay more liberally. The island has been exempt from yellow fever and small-pox for several years, though both diseases have been prevalent during that time on adjacent islands. Vaccination is generally practiced. The contagious diseases of children, such as measles and scarlatina, are comparatively rare. Venereal diseases are very common; also elephantiasis and phthisis pulmonalis, the last generally progressing rapidly to a fatal termination.

Framboesia or yaws is the scourge of the island. It is confined almost entirely to the negroes and to the lowest and poorest of them, but all classes and shades of color have been affected by it. A few years ago this disease was so prevalent on the island as to seriously threaten its welfare by disabling the laboring class. Hospitals were established and the afflicted gathered in them and treated. During the years 1878 and 1879 about 1,000 cases were isolated and treated. The disease is now so well under control that Dr. Nicholls, the superintendent of the yaws hospitals, confidently predicts its extermination if the means adopted are continued a year or two longer. Measures are, however, relaxed, and it is again on the increase. Dr. Nicholls, in his report for 1879, describes yaws as "belonging to the group of diathetic diseases," and not to the "cachectic, impetiginous, or exanthematous." Ordinarily it commences with malaise, which lasts only a few days; in some there is slight fever, and then the characteristic tubercular eruption appears. Near the juncture of the skin and mucus membranes, over the malar prominences and the genital region, are its favorite seats. Its course is not definite; under treatment it may decline in three weeks or it may remain several months, some tubercles disappearing, others becoming developed, and others aborting at various stages of their

growth. The patient meanwhile not feeling ill, the appetite continues good and general health is unimpaired. Where the surroundings are bad, such as poor or insufficient food, defective hygiene, &c., or where mercury or purgatives have been improperly used, a cachexia often becomes developed and the disease (*pian manqué*) becomes intractable and of long standing. Ulceration succeeding the tubercular stage, the feet are attacked and the sufferers are rendered incapable of earning a livelihood. They seldom of their own accord seek proper aid, but resort to numerous nostrums in which mercury enters largely, and often with serious results. Yaws resembles the exanthemata in being contagious and at times ushered in by fever. The latter does not often occur and there is no regularity in the course or duration of the eruption; it is essentially chronic; it may be engrafted on other skin diseases or cutaneous wounds and impress upon them its characteristics. The contagion of yaws does not operate through the atmosphere. It resembles that of syphilis in being inoculable. In a case inoculated by Dr. Nicholls the period of incubation was five weeks, and he believes that the disease is propagated solely by contagion. It is not hereditary. Children constitute one-half of the cases; of 600, 48 per cent. were under 10 years, and about 12 per cent. over thirty years of age. The proportion of males to females was as 60 to 40.

As a rule the disease occurs only once in the same individual, but relapses are reported as having occasionally occurred within a few months of the first attack, possibly from an incomplete eradication of the disease. The average duration of the disease, when properly treated, is about three months. Cleanliness, nourishing diet, alteratives including mercury, iodine, and iron, internally, with astringents and disinfectants locally, are chiefly relied on. Isolation is always advisable.

There are many points of resemblance between this disease and syphilis and also lepra tuberculosa that are of special interest. Its not being transmitted hereditarily, its being a disease chiefly of childhood, the eruption being always tubercular at some period, the mucus membranes and deep tissues being rarely involved, there being no cutaneous anæsthesia, and its amenability to treatment, stamp it as a distinct disease. Dr. Nicholls places it first in the diathetic group of Tilbury Fox, which includes syphilis, scrofula, and leprosy, the diathesis being least marked in yaws and most in leprosy.

The only yaws hospital at present on Dominica is at Roseau, the chief port. It is located on a hill, Morne Bruce, about 800 feet above the town. There were 30 inmates at the time of visit, most of them youths of between three and twenty years; a few of the adults were probably incurables, from the long duration of the disease and the destruction wrought by it. In one, a woman, the face was covered as with rupia, the nasal arch was destroyed and her labored breathing indicated involvement of the air passages; it was said she had asthma and not syphilis as a complication. The treatment was iron and sulphide of calcium. In two or three other cases, one or more phalangeal joints were affected, the articulations seemed to be destroyed, the fingers, shortened, and the soft tissues immediately around the joints much infiltrated, and had the swollen, shining appearance of leprosy. They may have been complicated with that disease, but the medical attendant thought not and was treating them solely for yaws. A physician on another island informed me that although he had seen hundreds of cases of this disease, he not unfrequently was puzzled in its diagnosis and would at times refer to some of the old women in the vicinity, and

when they decided the case to be "yawy," they were invariably correct. There was little to commend about this hospital; it seemed as if the opposite extreme was being adopted from the activity that is said to have prevailed a few years previously.

In the town of Roseau is an infirmary for the sick poor of the place. It had about 50 patients, chiefly cases of phthisis, malarial fevers, and accidents. Sailors would be cared for in it on payment of actual expenses.

Port Castries, St. Vincent, is now a favorite coaling-station in the Windward Islands. Its facilities for loading coal are unequalled on any other island. It is a comparatively healthy port. The *fer de hame*, a poisonous serpent, seemed to be the chief dread of its people; about 12 deaths occurred annually from its bite. The annual rainfall is about 80 inches. It has a general hospital a short distance from the town, with two medical attendants. At the time of visit it had 110 inmates, many of them East Indian coolies suffering from malarial affections. A ship-load had recently arrived, nearly all with impaired health. Many had syphilis. A number were suffering from chronic malarial poisoning, characterized by enormously enlarged spleens, dropsical effusions, and cardiac complications. They had been fattened previous to shipping, but the voyage and change in living had caused their old diseases to assume the ascendant. The hospital seemed to be liberally managed. There is also on the island a lunatic asylum, with a few inmates, and a yaws hospital. An act had recently been passed for the isolation and treatment of yaws cases, but was not yet enforced. This disease was not as prevalent here as in Dominica; but it was believed to be on the increase, hence the enactment. There were five Government physicians on the island, with salaries varying from 300 to 600 pounds sterling each per annum. They were appointed over districts, as in Dominica.

Port of Spain, the chief port of Trinidad, was visited in March. Its average annual temperature is about 78° Fah., and rainfall about 80 inches. Its population, according to the census of April, 1881, was 31,858. That of Trinidad was 153,128; males, 83,716, females, 69,307; creoles, exclusive of 12,800 of East Indian parentage, 69,307; East Indians, or coolies, 36,020. The increase of population during the decade was 40 per cent.; nearly 24,000 coolies arrived from India during that period. About 66,000 persons were employed in agriculture. There were 1,320 inmates of hospitals and other charitable institutions, and 641 prisoners and convicts. There were produced in and exported from Trinidad, during the year previous to the taking of the census, 150,090,000 pounds of sugar, 1,500,000 gallons of molasses, 30,000 gallons of rum, 25,000 gallons of bitters and liqueurs, 12,000,000 pounds of cocoa, 5,000,000 cocoa-nuts, and 23,000 tons of asphalt. The exports were increasing annually.

There are 38 regular medical practitioners on the island and 25 licensed midwives; nearly all of the former hold government appointments, receiving from £300 to £1,000 sterling each per annum, besides fees from private practice. These appointments are obtained, as in other islands, from the Secretary of State for the colonies in England. Applicants are required to possess a diploma from a recognized medical college in the United Kingdom, and to present proper testimonials—citizenship not being necessary. They are appointed as vacancies occur, and are required to serve one or more years in the Colonial hospital at Port of Spain, or until vacancies occur in outlying districts, afterward being stationed in more desirable districts as they become

vacant, such desirability depending on social and pecuniary advantages, which in some districts are considerable.

The mortality rate of Trinidad is probably high; in the largest hospital, for the first six months of 1881, it was 11.24 per cent of the number of persons treated, and in the second largest it was 9.18 per cent. During 1881 yellow fever prevailed to a limited extent; there were about 40 deaths from it, chiefly among the whites; it was probably imported from Demerara. The Surgeon General styled it "hæmorrhagic malarial fever," but other practitioners pronounced it yellow fever.

The colonial hospital at Port of Spain is one of the largest and best appointed establishments in the West Indies. The main building is constructed of stone, is two stories high and has accommodations for about 400 patients. Around it are extensive grounds in which are several wooden buildings where cases of dysentery, syphilis, yaws, ulcers, &c., are treated. There is also a comfortable residence for the surgeon in charge, quarters for four assistants, nurses, attendants, &c., and a gate-keeper's lodge, where a bell is tolled announcing the entrance of persons and who they are. At the time of our visit the hospital was much crowded, having about 500 inmates.

The lower story of the main building is occupied chiefly by women, infants, and girls. The wards contained about 30 beds, each placed about 2 feet apart and along their four sides. Their floors are of asphalt, which is, however, to be replaced by wood; the ceilings are lofty, and large apertures for ventilation exist near them; the doors and windows are numerous and spacious, the latter being closed with swivel-blinds of wood instead of glass. There is a separate ward for venereal cases. All are too crowded, though the climate admitted of the freest ventilation. The upper story is devoted to men and boys, and comprises one continuous ward of about 400 feet in length and 80 feet in width. This space is intersected by low partitions of polished wood and movable frames, containing swivel-blinds, which divided it into five central sections or compartments, and a broad corridor surrounding the whole, with free communication existing throughout. The approach is by a broad and handsome mahogany stairway, leading from the main entrance of the building to the center of the upper ward. On reaching the head of this stairway, the *coup d'œil* is quite imposing as the vision extends over this enormous ward, with its polished woods of many hues and its 200 beds with their white linen and dusky occupants; but the thought arose that the inmates might fare better if they were in smaller, though less pretentious, structures, scattered throughout the grounds. The compartments and corridors are filled with beds. During the prevalence of yellow fever, five months previously, cases of that disease were admitted into this ward, and no attempt made at isolation. It was reported that not a case of the disease originated in the hospital.

In the small wooden buildings several cases of dysentery were being treated, chiefly with ipecac, which was generally efficacious. The disease is quite prevalent among the coolies at all seasons. Chronic ulcers are also numerous, and are found very intractable. Most of the amputations and primary operations do well. Erysipelas is occasionally prevalent; it is not isolated, neither was yaws. A patient with the latter stated that he contracted the disease in the hospital. In the same ward were two cases of herpes circinatus and two well-marked cases of yaws in adjoining beds; one pure and simple, the other complicated with syphilis. The eruption in each nearly covered the entire body, face, and extremities, and was of about the same duration; in the former it was disappearing, it was less elevated, and the circular form

of the patches not as well defined as in the syphilitic, where many of them resembled those of rupia; the crusts were thicker in the latter, but the tubercle peculiar to yaws was distinct, the subjacent tissues being indurated and the crescentic form of the eruption and ulcers well marked. In the simple case, when a tubercle was detached, the surface it had occupied was smooth, or the seat of an ulcer with smooth edges; in the syphilitic, the seat of the tubercle was irregular and indurated, or, if an ulcer, its edges were indurated and it presented a dirty appearance. In both, the glandular system was involved, but in the simple variety induration followed ulceration, and was not so general as in the syphilitic, where it preceded it. The treatment was the same in both—local applications and iodide of potassium internally. No perceptible improvement had taken place in the syphilitic.

At *Port au Prince* is a military hospital wretchedly conducted; during the small-pox epidemic, a year previous to our visit, it was crowded with patients who were grossly neglected, receiving little or no care, and were allowed to crawl into the streets and beg, though the person in charge was amply paid for their proper care and treatment. There is also a small civil hospital that has little about it to commend. In the event of yellow fever breaking out on any of our vessels visiting the port, good accommodations could be secured in private houses in the town, together with excellent nursing and medical attendance.

There is a medical school at Port au Prince where students are instructed in the elements of a medical education, and are required to complete it in France. Practitioners must have a diploma from some recognized French school, or pass an examination in Hayti.

During the recent epidemic of small pox upwards of 80,000 persons were attacked, and many thousands died; the number is not known. Vaccination was practised largely, but much of the virus used was inert. An American practitioner informed me that the virus received from England was much more reliable than that from the United States, though he had tried it extensively from most of our prominent sources of supply. The corrupt financial practices common among officials of the Haytien Republic extended even to the purchasing of vaccine virus and the care of the sick. There were no cases of small pox on the island during our visit, nor had there been any for several months. Yellow fever is endemic in Port au Prince. Our anchorage was well chosen, being about 3 miles from the city and a mile from the shore, where full benefit of the land and sea breezes was obtained.

San Domingo City is probably one of the healthiest ports on the island. It has a military and private hospital and lazaretto—none of them commendable.

At *Port Royal, Jamaica*, is an extensive naval hospital in connection with the dock-yard in charge of a deputy inspector-general. It was commenced early this century, when large fleets assembled in the vicinity, and was intended to accommodate several hundred patients. At the time of visit there were about ten. It is also used as a depot for medical supplies for the station. There were three medical officers attached to it who, in addition to caring for the hospital and its inmates, issuing stores, &c., were required to attend the workmen at the dock-yard, about 150, and their immediate families. The hospital was in excellent order, and possessed all the requirements necessary for a large establishment in a tropical and unhealthy country. It is, however, much too large for any demands ever likely to be made upon it, and of course entails unnecessary expense. Patients on entering are conveyed to a room at the landing, where they are stripped, weighed,

their full description taken, given a bath, dressed in hospital uniform, which they wear while inmates, and then taken to their appropriate wards. Their clothing and other articles brought with them are placed in a locked room, to which they have access at stated intervals. A daily report is sent to the commandant of the station, and he visits the hospital weekly for the sole purpose of witnessing the payment of the inmates who are "service men." In October last 40 cases of yellow fever were treated here. The disease was of a mild type. Occasional cases have occurred in the vicinity since then—one within a month, at the barracks across the harbor in a soldier recently arrived from England, said to have been caused by exposure to the sun while fishing. At the time of our visit it was reported that there were one or two suspicious cases in the barracks near Kingston. The disease is probably endemic in Kingston and Port Royal. The crews of English vessels of war are not granted liberty there. Montego Bay or St. Ann's, on the north coast, are generally selected for that purpose.

I have been unable to ascertain that quarantine is established against yellow fever at any West Indian port. Vessels from ports where small-pox prevails are, however, rigidly quarantined, an absence of at least 14 days and freedom from the disease being required. Baltimore, New Orleans, and all Haytien ports were declared infected by the Kingston board of quarantine commissioners, and owing to our being only six days from Jacmel, Hayti, this vessel was placed in quarantine by the health officer at Port Royal until representations were made to the board of the healthy condition of the ship and crew, and that the ports visited were free from infection, when we were granted pratique.

The quarantine station is about $1\frac{1}{2}$ miles distant from Port Royal, on the opposite side of the harbor; daily communication can be had there with Kingston through the health officer; boat hire is not expensive, being about one dollar a trip.

Kingston as a coaling station for our vessels is undesirable; they are required to lay alongside a wharf while coaling; the drainage and sewerage of the town empties in the vicinity; the process of coaling is slow; less than 20 tons an hour were put on board this vessel, and there were innumerable delays with the laborers. None of these objections exist at Castries, St. Lucia; 40 tons an hour were put on board there, and more could have been if required; the coal was cheaper and the place healthier.

Aspinwall at the time of our visit was exceptionally healthy; the dry season had prevailed uninterruptedly over two months. During the past year a hospital had been erected by the Interoceanic Canal Company at the northeastern end of the town, containing 50 beds. It is a wooden structure, roughly built on piles over the beach, the sea flowing underneath. At the time of our visit there were about twenty patients, mostly accidents. The staff consists of one surgeon, an apothecary, two nurses, and four Sisters of Charity. There were two large wards with 20 beds in each, and a number of smaller ones, containing one or more beds for officials; also two isolated wards for contagious diseases; all were plainly but sufficiently furnished. The dispensary was well supplied with stores from the chief dispensary at Panama.

In the town of *Aspinwall* the canal company have another dispensary, in charge of a medical officer, for the use of its employés. There is also stationed in the town a medical officer to attend employés at their domiciles, and another to visit them on the canal works throughout the Colon section, which extends nearly to Gatun, and on it at present about 2,000 men are employed. The latter two officers decide

what cases are to be treated in hospital. Workmen when in hospital receive half pay until discharged. No deduction is made from officers.

The route of the canal is, at present, divided into eight sections, and on it nearly 7,000 men are employed; the number is steadily increasing, and it is expected that at the beginning of the next dry season it will amount to 10,000. A hospital has been constructed at the headquarters of each section containing about 20 beds, and a medical officer placed in charge, except at Aspinwall and Panama, where the accommodations are greater, and to which all patients are sent who are seriously ill and can be transferred from the various sections.

The canal company's establishment for the sick at Panama is an extensive affair. About 50 acres of land have been selected on the southeastern slope of Ancon hill, at San Miguel, a suburb of Panama; throughout it wide roads and broad terraces have been constructed, thorough drainage effected, shrubberies and flower gardens tastefully laid out and planted, and the entire grounds were being beautified and made useful. Over 20 buildings were erected and others were under construction. Those used as wards were on the most elevated terraces about 250 feet above the sea, which they partly overlooked, and were exposed to all the prevailing winds. The buildings are chiefly of wood and iron, of neat design, lightly but compactly built. Those for the hospital proper each comprised one ward of about 20 beds, a small dispensary, nurse's apartment, and dependencies; were partially surrounded by piazzas, which in some cases extended to an adjacent ward, with water-closets and bath-rooms intervening. Those for officers consisted of four or more rooms with one or more beds in each neatly and comfortably furnished; there was one similar to them for the wives and children of employés requiring hospital treatment; and others more isolated with wards for contagious diseases, and containing all the appointments necessary for complete isolation. Also separate buildings for kitchens, laundry, store-rooms, pharmacy, mortuary, chapel, gate-keepers, quarters for most of the attendants, and surgeon's residence, all of them suitably furnished or in process of being so. When the plans that were being carried out are completed there would be accommodations for 700 patients; at present about half that number could be cared for.

At the time of visit there were 200 inmates, about 40 of them with gunshot wounds and other injuries received during a recent riot among the workmen—between negroes from Jamaica and natives of Central America; there were several cases of pneumonia and bronchitis, heretofore uncommon diseases on the isthmus, due to exposure at the works in the mountain sections. Venereal diseases were also well represented. All of the surgical cases were doing well; carbolized dressing was exclusively used and all operations were performed antiseptically. Erysipelas had occurred, but was readily controlled. A case of excision of half of the radius, and another of removal of the superior maxilla were presented, nearly recovered; also another, illustrating the wonderful vitality and recuperative power of the patient as well as the care and treatment he had enjoyed, was a negro of rather poor physique who had fracture of the pelvic bones complicated with rupture of the bladder and extravasation of urine. Pelvic cellulitis and peritonitis ensued and later on pulmonary gangrene. He had nearly recovered from all, with firm union but some displacement of the pubic bones. A case of yellow fever had been treated a month previously. The surgeon in chief, Dr. Girend, to whom I am indebted for much attention, informed me that he considered the disease endemic on the isthmus, and that he awaited the termination of the rainy season for a large influx of cases.

The supply of instruments and surgical appliances was very complete, embracing all of newest design that were likely to be of use, fracture beds, electro-medical apparatus, gas generators, &c. The pharmacy possessed a large supply of crude drugs; most preparations are made in it, prescriptions compounded, the several hospitals on the route supplied with medical stores from it, and all analyses made that may be required by the company.

It was said that \$1,000,000 had been expended on the entire hospital establishment of the company; it is probable that more than that sum will be required to complete what the present system contemplates.

Second only to the financial question is the sanitary one, upon which the success of the canal undertaking depends. The measures adopted and still further proposed seem to indicate a wise, humane, and economical policy on the part of the direction. Ordinary sickness and accidents will be promptly relieved, and epidemics, if not prevented, held well under control. Though the work in certain localities and at certain seasons will necessarily entail sickness, much more so than the construction of the Panama Railroad did, it is not only improbable but almost impossible that there can be a relative mortality at all approximating that which disgraced the latter enterprise.

REPORT OF SURGEON GEORGE R. BRUSH.

U. S. S. VANDALIA.

St. Thomas is situated in latitude $18^{\circ} 20'$ north, longitude $64^{\circ} 56'$ west; distant from New York 1,643 miles. Its length is about 13 miles, east and west, with an average breadth of 3 miles. A range of dome-shaped hills runs through the entire length, giving off many spurs or branches toward the north and the south. The main range is highest near the west end, where it reaches an elevation of more than 1,500 feet.

The harbor and town, Charlotte Amalia, lie about midway of the island on the south side. The town, situated on the north side of the harbor, is built partly on a level and partly on three hills. The principal street runs east and west, parallel with the shore. The buildings are of stone or brick, and mostly of one story. A few other streets run parallel with this, the others run north and south at right angles to these. They are all well paved and generally clean. The town is lighted with gas, which is supplied at \$5 per thousand feet. There are a number of well-kept public wells in the streets of the lower part of the town, which supply brackish water used by animals and by some of the lower classes. Most dwellings are furnished with cisterns. Ships are supplied with rain water, which is collected in a reservoir from a hillside, specially prepared and covered with cement. Ice is imported and sold at a very moderate price. Excellent fish are abundant. Flour is imported from the United States, beef from Porto Rico, potatoes from the United States, Canada, and France. Tropical fruits are chiefly brought from the adjoining islands. The prevailing winds are the northeast trades. The daily variation of temperature seldom exceeds 9° Fah.; one observer gives the highest temperature observed during three consecutive years, $90^{\circ}.5$ Fah., and the lowest for the same period, $66^{\circ}.8$ Fah. The warmest months are July, August, and September; the coldest, December, January, and February, the most variable being May, June, October, and November.

The following table gives the average annual fall of rain as observed by Dr. Hornbeck from 1828 to 1839:

	English inches.
January	2.6
February	2.8
March	2.7
April	2.8
May	5.0
June	3.1
July	3.5
August	5.1
September	5.6
October	5.1
November	5.7
December	2.8
Annual mean for eleven years	46.8

The rain generally falls in showers, a continuous fall for twenty-four hours being seldom known. It is said that a drought will sometimes prevail for six or nine months, to be followed by deluges of rain.

The only running water is found in the eastern part of the island. This stream loses itself in the earth near the beach of Yerse Bay.

The seat of government of the Danish West Indies was removed from St. Croix to this place in 1872.

The population of the town is about 14,000; that of the entire island, 15,000.

There are five resident practitioners of medicine, who are required to obtain authority to practice from Copenhagen. Only one drug store is allowed, the proprietor of which in consideration for this monopoly, is required to supply the indigent with medicines free of charge. A committee of physicians regulate the price of drugs. The quarantine station and lazaretto are located at Mulenfeldt's Point, on the east side of the harbor. Persons undergoing quarantine are charged \$2.50 a day for subsistence in a separate building provided for that purpose. The health officer boards vessels coming from ports declared infected. Charges for square-rigged vessels and steamers, \$5; for schooners, \$3. A double fee is charged after 6 p. m. and before 6 a. m. Captains of vessels can contract with a physician to attend the crew at the rate of \$3 each for a period not exceeding six weeks. When no contract is made \$1.25 is charged for a single visit. Charges in hospital are from \$2 to \$5 per diem.

The accompanying tables of diseases, deaths, and births for the year 1882 were kindly obtained for me by the American consul, V. V. Smith.

The St. Thomas Times and the St. Thomas Tidende are published weekly, and the Bulletin daily, giving dispatches received by cable. In the reading-room of the athenæum, which was founded in 1839, and now contains a library of about 15,000 volumes, may be seen the current newspapers, magazines, and reviews.

REPORT OF SURGEON R. A. MARMION.

U. S. S. PORTSMOUTH.

Whilst the ship was in Portsmouth, I paid a visit to Eastney Barracks, the headquarters of the Royal Marine Artillery, situated on the beach beyond Southsea, and about 3 miles from the dockyard. One of the objects of my visit was to examine the new "sick quarters" just constructed there, but not yet occupied.

This establishment, notwithstanding its modest title, is a fully appointed substantial hospital with a nominal capacity of thirty-six beds, although that number can with impunity be exceeded. The building is of brick, two stories high, and, architecturally speaking, rather unpretending. Interiorly it is devoid of ornamentation of any kind. It is divided into a number of small wards extending the entire depth of the building, the front looking toward the outskirts of Southsea, while the rear windows look out upon the water and the Isle of Wight. Ventilation is effected partly through openings in the walls near the ceiling, communicating directly with the outer air, and partly by means of fireplaces. The latter are so constructed that when not in use for heating purposes, by a simple mechanism the grate can be hidden from view, and at the same time the flue is brought into requisition for ventilation.

The boast of the hospital is their apparatus for disinfecting clothing. This consists of a sheet-iron box about 5 feet long by 3 high and deep, surmounted by a hinged lid. At one end, near the top, is an opening through which it communicates with a chimney flue, while at the other end, but near the floor of the box, there is a sliding door to admit cold air when necessary to moderate the temperature of the contained air. A thermometer graduated to 280° is attached to the end of the apparatus next the chimney. A gas-pipe with numerous very small orifices in its upper surface is placed beneath the box a short distance from the floor of it, and extends around parallel to each of its sides and ends. An unimportant feature of the apparatus is a chain with counterpoise weight passing over a pulley overhead, and attached to the lid of the box so as to lift it and hold it open. When clothing is to be disinfected it is hung on rods inside the box, the lid is lowered, and the gas lighted underneath the box, an attendant watching the thermometer so as to prevent scorching the contents. As explained above, he has perfect control over the temperature by means of the cold-air door. A simple and inexpensive apparatus like this would be a valuable adjunct to our hospitals.

Brest is in latitude $48^{\circ} 24'$ north and longitude $4^{\circ} 29'$ west, and is the principal city of the department of Finisterre, France. It is situated on the north side of the bay or road of the same name, which is one of the finest harbors in the world. The town is at the foot, on the sides and summit of a steep hill, and the streets, in its older portions, are narrow, dirty, and crooked. In some instances communication between the lower and upper parts of the town is effected only by long, steep stairs.

The population in 1876 was 66,828, exclusive of the garrison. The climate of Brest is mild and humid, and fogs are very prevalent. During our stay of nine days it rained most of the time. The prevailing winds are westerly and storms are common.

Commercially the place has very little importance, its foreign trade amounting to very little; indeed, all of its industries and enterprises

depend in some way upon the extensive navy-yard situated here. The only object of interest to a medical man is the naval hospital, an extensive granite building, situated on the side of a hill convenient to and overlooking the navy-yard basin. It has a capacity of 1,800 beds, one-third of which were vacant at the time of my visit, is scrupulously neat in every respect, but badly ventilated, and in many parts very poorly lighted. Some of the wards are both dark and stuffy, and in no part of the establishment is there any ventilation except through the windows and doors, which, of course, are usually kept closed. Large wards are the rule for all patients, whether officers or enlisted men, those for the officers being less plainly furnished than the others. Convenient to all the wards there are small rooms where serious cases are treated, no officer even being given a room until he becomes seriously ill. There are lecture rooms in the hospital, and within its grounds a well-stocked botanical garden, a museum and library, all of which are used by the naval medical professors who regularly lecture here. To the tourist Brest offers fewer inducements, probably, than any French city of its size.

REPORT OF PASSED ASSISTANT SURGEON C. A. SIEGFRIED.

U. S. S. AJAX.

This station of the iron-clad vessels Ajax, Catskill, Manhattan, Mahopac, Lehigh, and, latterly, the Canonicus—all anchored in the James River, near the junction of the Appomattox River with it—is much subject to diseases of malarial origin. The anchorage is close along the southwestern shore, in the bend just below City Point, stretching along for about a mile, and slightly encroaching on the channel. The shore, more or less marshy, is within two hundred yards, with dense rank vegetation. The tide rise is from 4 to 6 feet, the water always muddy and sluggish in moving, and the river wide, at low tide exposing miles of shallows in every direction, sand-bars sometimes covered with weeds. The neighboring land is never high, with a thin soil of sandy and clayey composition, and is infertile and much washed out. The landscape, with stunted vegetation, is monotonous; there are no regular forests, and uncertain crops crown the labor of an impoverished, aimless population, mainly colored. The seasons do not materially differ from other regions of the State on the low lands, and need not be described here. The summer is long, and the latter part of August, the months of September and October, become dangerous to health and life by reason of disease common to all the inhabitants, and often fatal in its effects. The malarial diseases attack all indiscriminately, old and young of both sexes and black and white. For much of the year prophylactic medicine is used.

I find that no certain or accurate data can be compiled regarding the influences, meteorological or otherwise, that are of value in foretelling the virulence or prevalence of the disease. The conditions here found are simply the following: A low, wide country, sluggish muddy streams of greater or less extent, immense marshes fringing all watercourses and filling up their indentations and curves, a tide rise and fall exposing miles of noxious rank vegetation and sedimentary deposit, and a temperature above 40° Fah. probably eight months of the year continuously.

The station is 90 miles from the Atlantic Ocean, and 30 from Rich-

mond, Va. Easterly winds are moist, foretelling changes; southerly winds are warm and often oppressive, whilst the winds from northerly points are usually more wholesome and cooler. Storms are commonly from northerly points, northwest or north. The highest temperature recorded the present summer on the Ajax was 101° Fah., the variation in the twenty-four hours being about 11° . The average temperature for two weeks in July was 88° Fah., including three hot days in which the thermometer marked 99° , the nights being at 90° . I cannot assert this to be an exceedingly moist atmosphere, nor a dry one; hygrometric observations were not accurately determined. There is a liability to severe, sudden rain storms with very high wind.

Excepting diseases due to telluric or malarial influences, and a noticeable rheumatic tendency, I do not believe this to be an unhealthy station—provided residence is not too long continued. Diseases of mucous membranes, of the chest, and of the nervous system uncomplicated, are, I am inclined to believe, under favorable conditions.

TABLE I.—Showing the force on each ship, the number admitted and discharged, number

	Vessels.	Strength.	Strength corrected for time.	Admitted.					
				From last year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Total.
1	Ajax, 4th rate; 550 tons, iron-clad, screw; service, 365 days	36	36	.....	7	7	5	4	23
2	Alliance, 3d rate, 615 tons, wood, screw; service, 365 days	172	172	6	69	56	76	53	260
3	Alarm, 4th rate, 311 tons, torpedo-ram, screw; service, 273 days	52	40	.....	9	6	15	.....	30
4	Bache (Coast Survey), 4th rate; 365 days	25	25	.....	5	9	4	2	20
5	Colorado, 1st rate, 3,032 tons, wood, screw; service, 365 days	272	272	2	34	45	60	62	203
6	Constellation, 3d rate, 1,236 tons, wood, sails; service, 92 days	284	73	.....	.....	39	103	.....	142
7	Catskill, 4th rate, 496 tons, iron-clad, screw; service, 365 days	15	15	.....	2	2	8	2	14
8	Dale, 3d rate, 320 tons, wood, sails; service, 93 days	163	41	.....	.....	15	39	.....	54
9	Despatch, 4th rate, 730 tons, wood, screw; service, 365 days	68	68	.....	16	20	17	9	62
10	Enterprise, 3d rate, 615 tons, wood, screw; service, 354 days	185	179	.....	104	55	53	41	253
11	Franklin, 1st rate, 3,173 tons, wood, screw; service, 365 days	185	185	4	27	38	48	43	160
12	Gedney (Coast Survey), 4th rate; service, 365 days	29	29	2	5	1	7	1	16
13	Jamestown, 3d rate, 888 tons, wood, sails; service, 365 days	248	248	.....	23	39	79	130	271
14	Kearsarge, 3d rate, 695 tons, wood, screw; service, 365 days	200	200	5	52	44	49	57	207
15	Lehigh, 4th rate, 496 tons, iron-clad, screw; service, 365 days	14	14	.....	2	4	7	3	16
16	Minnesota, 1st rate, 3,000 tons, wood, screw; service, 365 days	200	200	3	31	23	45	46	148
17	Michigan, 4th rate, 450 tons, iron, paddle; service, 365 days	91	91	3	28	11	18	20	80
18	Manhattan, 4th rate, 550 tons, iron-clad, screw; service, 365 days	13	13	.....	2	1	6	2	11
19	Montauk, 4th rate, 496 tons, iron-clad, screw; service, 339 days	46	43	.....	4	6	7	6	23
20	Mahopac, 4th rate, 550 tons, iron-clad, screw; service, 365 days	16	16	.....	4	1	2	4	11
21	Mayflower, 4th rate, 306 tons, wood, screw; service, 92 days	43	11	.....	.....	.....	22	.....	22
22	Miantonomoh, 3d rate, 1,276 tons, iron-clad, screw; service, 90 days	127	33	.....	.....	.....	.....	13	13
23	Nantucket, 4th rate, 496 tons, iron-clad, screw; service, 137 days	71	26	.....	.....	.....	14	8	22
24	New Hampshire, 2d rate, 2,600 tons, wood, sails; service, 365 days	412	412	14	177	68	66	122	447
25	Powhatan, 2d rate, 2,182 tons, wood, paddle; service, 365 days	251	251	1	61	57	34	21	174
26	Passaic, 4th rate, 496 tons, iron-clad, screw; service, 283 days	79	59	.....	24	17	12	25	78
27	Portsmouth, 3d rate, 846 tons, wood, sails; service, 365 days	305	305	3	55	77	79	46	260
28	Saratoga, 3d rate, 757 tons, wood, sails; service, 365 days	286	286	.....	21	44	31	24	120
29	St. Louis, 3d rate, 431 tons, wood, sails; service, 365 days	122	122	.....	37	20	39	17	113
30	Standish, 4th rate, 306 tons, wood, screw; service, 92 days	77	20	.....	.....	4	19	.....	23
31	Tennessee, 1st rate, 2,840 tons, wood, screw; service, 365 days	471	471	8	85	98	78	58	327
32	Tallapoosa, 4th rate, 650 tons, wood, paddle; service, 365 days	125	125	.....	49	53	55	41	198
33	Vandalia, 2d rate, 981 tons, wood, screw; service, 365 days	195	195	5	19	21	21	49	115
34	Wabash, 1st rate, 3,000 tons, wood, screw; service, 365 days	119	119	1	26	34	18	17	96
35	Wyoming, 3d rate, wood, screw; service, 348 days	120	110	1	22	23	25	15	86
36	Wyandotte, 4th rate, 550 tons, iron-clad, screw; service, 365 days	68	68	.....	3	5	9	8	25
37	Yantic, 3d rate, 410 tons, wood, screw; service, 365 days	141	141	4	23	21	22	18	88
Grand total		5,326	4,714	62	1,026	964	1,192	967	4,211

of days under treatment, and average per thousand of force on the North Atlantic Station.

Cured.	Discharged.				Continued.	Number of sick days.	Average number of days under treatment.	Daily average number of sick.		Number admitted per thousand of force.
	Invalided.		Died.	Total.				Absolute.	Per thousand of force.	
	To hospital.	From the service.								
18	5	.....	.....	23	.....	134	5.82	.36	10.00	638.88
238	17	.....	.....	255	5	1,763	6.78	4.83	28.08	1,511.62
15	15	.....	.....	30	.....	66	2.20	.24	6.00	750.00
15	5	.....	.....	20	.....	91	4.55	.24	9.6	800.90
119	79	.....	.....	198	5	729	3.59	1.99	7.31	746.32
127	15	.....	.....	142	.....	717	5.04	7.79	106.71	1,945.20
13	1	.....	.....	14	.....	62	4.42	.16	10.66	933.33
52	2	.....	.....	54	.....	279	5.16	3.00	73.17	1,317.07
51	11	.....	.....	62	.....	423	6.82	1.15	16.91	911.76
212	39	.....	1	252	1	1,747	6.90	4.93	27.54	1,413.40
128	26	1	.....	155	5	954	5.96	2.61	14.10	864.86
11	5	.....	.....	16	.....	202	12.62	.55	18.96	551.72
217	32	.....	1	250	21	1,932	7.12	5.25	21.17	1,092.74
186	17	.....	.....	203	4	1,990	9.61	5.45	27.25	1,035.00
14	2	.....	.....	16	.....	76	4.75	.20	14.28	1,142.85
128	16	1	.....	145	3	988	6.67	2.70	13.50	740.00
70	5	2	3	80	.....	1,023	12.78	2.80	40.76	879.12
9	1	.....	1	11	.....	167	15.18	.45	34.61	846.15
16	7	.....	.....	23	.....	103	4.47	.30	6.97	534.88
10	1	.....	.....	11	.....	73	6.63	.20	12.50	687.50
21	1	.....	.....	22	.....	114	5.18	1.23	111.81	2,000.00
9	4	.....	.....	13	.....	91	7.00	1.01	30.60	393.93
13	9	.....	.....	22	.....	69	3.13	.50	19.23	846.15
391	31	12	4	438	9	4,132	9.24	11.32	27.47	1,084.92
151	22	.....	1	174	.....	1,448	8.32	3.96	15.77	693.22
59	19	.....	.....	78	.....	363	4.65	1.28	21.69	1,322.03
195	61	.....	3	259	1	2,536	9.75	6.94	22.75	852.45
101	18	.....	1	120	.....	1,729	14.40	4.73	16.53	419.58
86	26	.....	.....	112	1	563	4.98	1.54	12.62	962.22
18	5	.....	.....	23	.....	61	2.65	.66	33.00	1,150.00
284	34	.....	2	320	7	2,931	8.96	8.03	17.04	694.26
162	31	.....	1	194	4	1,185	5.98	3.24	26.77	1,584.00
87	26	.....	1	114	1	954	8.29	2.61	13.38	589.74
64	32	.....	.....	96	.....	416	4.37	1.13	9.40	806.72
85	1	.....	.....	86	.....	550	6.39	1.58	14.36	781.81
11	14	.....	.....	25	.....	82	3.88	.22	3.23	367.64
81	7	.....	.....	88	.....	629	7.14	1.72	12.19	624.11
3,467	642	16	19	4,144	67	31,372	7.45	85.95	18.23	893.29

TABLE II.—Showing the number of cases, the discharged, invalided and dead, for

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Catarrhus epidemicus.....	3	.63	6
Erysipelas.....	5	1.06	18
Febricula.....	40	8.48	139
Febris cerebro-spinalis.....	1	.21	4
Febris continua simplex.....	27	5.72	290
Febris enterica.....	8	1.69	195
Febris intermittens.....	389	82.52	1,590
Febris remittens.....	58	12.30	541
Morbilli.....	3	.63	3
Parotitis.....	2	.42	4
Roseola.....	3	.63	91
Rötheln.....	2	.42	8
Scarlatina.....	5	1.06	5
Vaccina.....	70	14.84	514
Varicella.....	1	.31	1
Variola.....	1	.21	2
Varioloides.....	5	1.06	9
Total.....	623	132.15	3,420
II.—CONSTITUTIONAL DISEASES.			
Adynamia.....	43	9.10	311
Anæmia.....	5	1.06	19
Carcinoma.....	1	.21	1
Hypertrophia.....	1	.21	21
Lumbago.....	38	8.06	245
Podagra.....	4	.84	28
Rheumatismus acutus.....	136	28.85	1,497
Rheumatismus chronicus.....	97	20.57	889
Rheumatismus gonorrhoeicus.....	1	.21	8
Scrofula.....	1	.21	4
Senectus.....	2	.42	51
Syphilis primitiva.....	76	11.12	928
Syphilis consecutiva.....	69	14.63	768
Torticollis.....	1	.21	1
Total.....	475	100.76	4,771
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Apoplexia.....	2	.42	19
Cephalagia.....	47	9.96	140
Cerebritis.....	1	.21	1
Chorea.....	2	.42	3
Convulsio.....	4	.84	4
Dementia.....	5	1.06	33
Epilepsia.....	13	2.75	175
Hysteria.....	6	1.27	34
Insolatio.....	5	1.06	24
Insomnia.....	3	.63	7
Mania.....	4	.84	8
Melancholia.....	4	.84	21
Meningitis.....	3	.63	4
Nausea marina.....	59	12.51	181
Neuralgia.....	75	15.91	496
Neuritis.....	1	.21	25
Paralysis.....	1	.21	2
Pleurodynia.....	7	1.48	27
Sciatica.....	1	.21	21
Vertigo.....	10	2.12	24
Total.....	253	53.66	1,249

each disease, and their ratio per thousand of force, on the North Atlantic Station.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.01		2	2	.42	1	.21					
.04		3.6	2	.42	3	.63					
.38	.08	3.47	38	8.06	2	.42					
.01		4							1	.21	
.79	.16	10.74	21	4.45	6	1.27					
.53	.11	24.37	3	.63	4	.84			1	.21	
4.35	.92	4.08	349	74.03	37	7.84			2		1
1.48	.31	9.32	48	10.18	8	1.69	1	.21			1
		1			3	.63					
.01		2			2	.42					
.24	.05	30.33	3	.63							
.02		4	1	.21	1	.21					
.91		1			5	1.06					
1.40	.29	7.34	67	14.21	1	.21					2
		1			1	.21					
		2			1	.21					
.02		1.8			5	1.06					
9.36	1.98	5.48	534	113.27	80	16.97	1	.21	4	.84	4
.85	.18	7.23	24	5.09	19	4.03					
.05	.01	3.8	3	.63	2	.42					
		1			1	.21					
.05	.01	21			1	.21					
.67	.14	6.44	32	6.78	5	1.06					1
.97	.01	7	3	.63	1	.21					
4.10	.86	11	106	22.48	29	6.15					1
2.43	.51	9.16	66	14.00	29	6.15	1	.21			1
.02		8	1	.21							
.01		4	1	.21							
.13	.02	25.5	1	.21	1	.21					
2.54	.53	12.21	46	9.75	30	6.36					
2.10	.44	11.13	44	9.31	23	4.87					2
		1	1	.21							
13.07	2.77	10.04	328	69.58	141	29.91	1	.21			5
.05	.01	9.5	2	.42							
.38	.08	2.97	45	9.52	2	.42					
		1			1	.21					
		1.5			2	.42					
.01		1	2	.42	2	.42					
.09	.01	6.6			4	.84	1	.21			
.47	.09	13.46	5	1.06	5	1.06	3	.63			
.09	.01	5.66	4	.84	2	.42					
.06	.01	4.8	5	1.06							
.01		2.33	1	.21	2	.42					
.02		2	2	.42	2	.42					
.05	.01	5.25	2	.42	2	.42					
.01		1.33			2	.42			1	.21	
.49	.10	3.06	59	12.51							
1.35	.28	6.61	66	14	8	1.69					1
.06	.01	25	1	.21							
		2			1	.21					
.07	.01	3.85	6	1.27	1	.21					
.05	.01	21	1	.21							
.06	.01	2.4	10	2.10							
3.42	.72	4.93	211	44.76	36	7.63	4	.84	1	.21	1

TABLE II.—*Showing the number of cases, the discharged, invalided and dead,*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
II.—DISEASES OF THE EYE.			
Amaurosis.....	3	.63	41
Asthenopia.....	2	.42	4
Blepharitis.....	1	.21	2
Conjunctivitis.....	40	8.48	201
Hordeolum.....	3	.63	5
Iritis.....	8	1.69	85
Keratitis.....	1	.21	39
Ophthalmia.....	2	.42	6
Retinitis.....	4	.84	24
Sclerotitis.....	1	.21	51
Ulcus cornea.....	7	1.48	71
Total.....	72	15.91	529
III.—DISEASES OF THE EAR.			
Otalgia.....	6	1.27	43
Otitis.....	11	2.33	56
Otorrhœa.....	14	2.96	148
Surditas.....	2	.42	8
Total.....	33	6.99	255
IV.—DISEASES OF THE TEETH.			
Odontalgia.....	7	1.48	18
Parulis.....	1	.21	4
Total.....	8	1.69	22
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Aneurysma.....	3	.63	50
Angina pectoris.....	1	.21	6
Dilatatio cordis.....	1	.21	2
Hypertrophica cordis.....	1	.21	1
Morbi valvularum cordis.....	7	1.48	27
Palpitatio.....	16	3.39	146
Phlebitis.....	1	.21	10
Syncope.....	1	.21	3
Varix.....	1	.21	8
Total.....	32	6.78	253
VI.—DISEASES OF RESPIRATORY SYSTEM.			
Asthma.....	8	1.69	59
Bronchitis acuta.....	168	35.63	1,405
Bronchitis chronica.....	36	7.63	301
Catarrhus.....	140	29.91	622
Epistaxis.....	2	.42	2
Hæmoptysis.....	5	1.06	83
Laryngitis.....	16	3.39	68
Phthisis pneumonica acuta.....	3	.63	105
Phthisis pneumonica chronica.....	17	3.60	252
Pleuritis.....	9	1.90	45
Pneumonia.....	18	3.81	291
Total.....	422	89.52	3,233
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Cholera morbus.....	23	4.87	58
Colica.....	58	12.30	141
Congestio hepatis.....	6	1.27	64
Constipatio.....	28	5.94	95
Diarrhœa acuta.....	191	40.51	617
Diarrhœa chronica.....	9	1.90	34
Dysenteria acuta.....	14	2.96	82
Dysenteria chronica.....	5	1.06	43

for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.11	.02	13.66	1	.21	1	.21					1
.01		2			2	.42					
		2	1	.21							
.55	.11	5.02	36	7.63	4	.84					
.01		1.66	3	.63							
.23	.04	10.62	6	1.27	2	.42					
.10	.02	39	1	.21							
.01		3	1	.21	1	.21					
.06	.01	6	2	.42	2	.42					
.13	.02	51	1	.21							
.19	.04	10.14	3	.63	4	.84					
1.44	.30	7.35	55	11.67	16	3.39					1
.11	.02	7.16	5	1.06	1	.21					
.15	.03	5.09	9	1.90	2	.42					
.40	.08	10.57	13	2.75	1	.21					
.02		4	1	.21	1	.21					
.69	.14	7.27	28	5.94	5	1.06					
.04		2.57	7	1.48							
.01		4	1	.21							
.06	.01	2.75	8	1.69							
.13	.02	16.66			2	.42			1	.21	
.01		6			1	.21					
		2	1	.21							
		1			1	.21					
.07	.01	3.85	1	.21	4	.84	1	.21	1	.21	
.40	.08	9.12	12	2.33	4	.84					
.02		10	1	.21							
		3	1	.21							
.02		8	1	.21							
.69	.14	7.90	17	3.60	12	2.54	1	.21	2	.42	
.16	.03	7.37	5	1.06	2	.42					1
3.84	.81	8.36	140	29.91	21	4.45					7
.82	.17	8.36	18	3.80	17	3.60					1
1.70	.36	4.44	157	29.06	2	.42	1	.21			
		1	1	.21	1	.21					
.22	.04	16.6	3	.63	2	.42					
.18	.03	4.25	15	3.18	1	.21					
.28	.05	35	1	.21	2	.42					
.69	.14	14.82	1	.21	15	3.18			1	.21	
.12	.02	5	4	.84	5	1.06					
.79	.16	16.16	7	1.48	9	1.90			1	.21	1
8.85	1.87	7.66	332	70.42	77	16.33	1	.21	2	.42	10
.15	.03	2.52	23	4.87							
.38	.08	2.43	57	11.09	1	.21					
.17	.03	10.66	5	1.06	1	.21					
.26	.05	3.39	24	5.08	4	.84					
1.69	.35	3.23	180	38.18	11	2.33					
.09	.01	3.77	6	1.27	3	.63					
.22	.04	5.85	11	2.33	3	.63					
.11	.02	8.60	2	.42	3	.63					

TABLE II.—Showing the number of cases, the discharged, invalided and dead,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.			
Dyspepsia	24	5.08	193
Enteritis	5	1.06	15
Fistula in ano	4	.84	20
Gastritis	4	.84	41
Gastrodynia	3	.63	14
Hæmatemesis	2	.42	50
Hæmorrhoids	32	6.78	222
Hepatitis acuta	3	.63	71
Hernia	24	5.08	244
Icterus	3	.63	40
Peritonitis	1	.21	3
Pharyngitis	47	9.96	191
Prolapsus ani	3	.63	51
Tonsillitis	141	29.91	621
Vermes	5	1.06	22
Total	635	134.70	2,932
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria	3	.63	5
Balanitis	5	1.06	23
Calculus	1	.21	1
Chancroides	52	11.04	652
Cystitis	9	1.90	83
Dysuria	1	.21	4
Enuresis	15	3.18	41
Epididymitis	1	.21	7
Gonorrhœa	91	19.30	903
Hæmaturia	1	.21	1
Hydrocele	5	1.06	61
Nephritis	6	1.27	151
Orchitis	51	10.83	470
Paraphymosis	1	.21	9
Phymosis	5	1.06	54
Prostatitis	1	.21	5
Urethræ strictura	10	2.12	111
Varicocele	6	1.27	21
Total	264	56.00	2,602
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Ankylosis	1	.21	4
Clavus	1	.21	3
Ostitis	2	.42	55
Periostitis	1	.21	16
Synovitis	17	3.60	234
Total	22	4.61	312
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus	125	26.51	943
Acne	1	.21	3
Anthrax	4	.84	30
Cellulitis	5	1.06	24
Eczema	16	3.39	119
Erythema	3	.63	26
Furunculus	148	31.39	851
Herpes	3	.63	66
Impetigo	3	.63	50
Intertrigo	1	.21	2
Lichen	2	.42	9
Onychia	9	1.90	64
Paronychia	51	10.83	564
Pemphigus	1	.21	12
Pernio	9	1.90	117
Prurigo	1	.21	1

for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.52	.11	8.04	16	3.39	8	1.69					
.04		3	2	.42	3	.63					
.05	.01	5			4	.84					
.11	.02	10.25	4	.84							
.03		4.66	3	.63							
.13	.02	25	2	.42							
.60	.12	6.93	26	5.51	5	1.06					1
.19	.04	23.66	2	.42	1	.21					
.66	.14	10.16	11	2.33	12	2.54	1	.21			
.10	.02	13.33	1	.21	2	.42					
		3			1	.21					
.52	.11	4.06	45	9.54							2
.13	.02	17	1	.21	2	.42					
1.70	.36	4.40	129	27.36	10	2.12					2
.06	.01	4.4	3	.63	2	.42					
8.03	1.70	4.61	553	117	76	16.12	1	.21			5
.01		1.66			3	.63					
.06	.01	4.6	4	.84							1
		1			1	.21					
1.78	.37	12.53	43	9.12	8	1.69	1	.21			
.22	.04	9.22	6	1.27	2	.42					1
.01		4			1	.21					
.11	.02	2.73	11	2.33	3	.63	1	.21			
.01		7	1	.21							
2.47	.52	9.92	76	16.12	14	2.96	1	.21			
		1			1	.21					
.16	.03	12.2	2	.42	3	.63					
.41	.08	25.16	2	.42	3	.63			1	.21	
1.28	.27	9.21	36	7.63	13	2.75					2
.02		9	1	.21							
.14	.02	10.8	3	.63	1	.21					1
.01		5			1	.21					
.30	.06	11.1	4	1.69	6	1.27					
.05	.01	3.5	6	1.27							
7.12	1.51	9.85	195	41.36	60	12.72	3	.63	1	.21	5
.01		4	1	.21							
		3	1	.21							
.15	.03	27.5	1	.21	1	.21					
.04		16	1	.21							
.64	.13	13.76	9	1.90	6	1.27	1	.21			1
.85	.18	14.18	13	2.75	7	1.48	1	.21			1
2.58	.54	7.54	111	23.54	10	2.12					4
		3	1	.21							
.08	.01	7.5	3	.63	1	.21					
.06	.01	4.8	4	.84	1	.21					
.32	.06	7.43	12	2.54	3	.63					1
.07	.01	8.66	3	.63							
2.33	.49	5.75	147	31.18							1
.18	.03	22	3	.63							
.13	.02	16.66	2	.42	1	.21					
		2	1	.21							
.02		4.5	2	.42							
.17	.03	7.11	7	1.48	1	.21					1
1.54	.32	11.05	49	10.45	1	.21					1
.03		12	1	.21							
.32	.06	13	9	1.90							
		1			1	.21					

TABLE II.—*Showing the number of cases, the discharged, invalided and dead,*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM—Continued.			
Psoriasis.....	4	.84	56
Scabies.....	13	2.75	19
Tinea.....	1	.21	8
Unguis involutus.....	5	1.06	44
Ulcus.....	75	15.91	1,469
Urticaria.....	3	.63	11
Total.....	483	102.46	4,488
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis.....	59	12.51	859
Lymphangitis.....	1	.21	3
Total.....	60	12.72	862
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Adenoma.....	1	.21	1
Cystis.....	3	.63	16
Fibroma.....	6	1.27	43
Polypus.....	1	.21	7
Sarcoma.....	1	.21	6
Total.....	12	2.54	73
C.—POISONS.			
Alcoholismus.....	59	12.51	176
Colica pictorum.....	2	.42	9
Delirium tremens.....	10	2.12	20
Ebriositas.....	7	1.48	16
Vulnus venenatum.....	2	.42	8
Total.....	80	16.96	229
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio.....	26	5.51	247
Ambustio.....	45	9.52	356
Concussio cerebri.....	13	2.75	118
Concussio spinalis.....	1	.21	62
Congelatio.....	10	2.12	38
Contusio.....	194	41.15	1,161
Fractura.....	32	6.78	592
Luxatio.....	14	2.96	102
Stremma.....	156	33.09	1,198
Submersio.....	4	.84	4
Suicidium.....	1	.21	1
Vulnus contusum.....	97	20.57	987
Vulnus incisum.....	61	12.93	565
Vulnus laceratum.....	56	11.88	570
Vulnus punctum.....	23	4.87	116
Vulnus sclopetarium.....	4	.84	25
Total.....	737	156.34	6,142
Grand total.....	4,211	893.29	31,372

for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.15	.03	14	3	.63	1	.21					
.05	.01	1.46			13	2.75					
.02		8	1	.21							
.12	.02	8.8	4	.84							1
4.02	.85	19.58	62	13.16	8	1.69	1	.21			4
.03		3.66	3	.63							
12.29	2.60	9.29	428	90.79	41	8.69	1	.21			13
2.35	.49	14.55	39	8.27	17	3.60					3
		3	1	.21							
2.36	.50	14.36	40	8.48	17	3.60					3
.04		1			1	.21					
.11	.02	5.32	3	.63							
.01		7.16	3	.63	2	.42			1	.21	
.01		7			1	.21					
.01		6	1	.21							
.20	.04	6.08	7	1.48	4	.84			1	.21	
.48	.10	2.98	54	11.46	4	.84					1
.02		4.5	2	.42							
.05	.01	2	4	.84	5	1.06					1
.04		2.28	7	1.48							
.02		4	2	.42							
.62	.13	2.86	69	14.63	9	1.90					2
.67	.14	9.5	26	5.51							
.97	.20	7.91	41	8.69	3	.63					1
.32	.06	9.07	8	1.69	3	.63			2	.21	
.16	.03	62	1	.21							
.10	.02	3.80	8	1.69	2	.42					
3.18	.67	5.98	184	39.03	8	1.69					2
1.62	.34	18.5	19	4.03	13	2.75					
.27	.05	7.28	10	2.12	3	.63	1	.21			
3.28	.69	7.61	129	27.36	18	3.81					9
.01		1							4	.84	
		1							1	.21	
2.70	.57	10.17	91	19.30	3	.63	1	.21			2
1.54	.32	9.26	57	12.09	2	.42			1	.21	1
1.56	.33	10.17	50	10.66	4	.84					2
.31	.06	5.04	23	4.87							
.06	.01	6.25	2	.42	2	.42					
16.82	3.56	8.33	649	137.67	61	12.93	2	.42	8	1.69	17
85.95	18.23	7.45	3,467	735.46	642	136.18	16	3.39	19	4.03	67

TABLE III.—Showing the number of cases, the invalided

Vessels or stations	New Hampshire.				Portsmouth.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas	1	1						
Febricula	10				8			
Febris cerebro-spinalis	1			1				
Febris continua simplex	3				9	2		
Febris enterica	1				1			1
Febris intermittens	26				8			
Febris remittens	3		1					
Morbilli								
Roseola								
Scarlatina								
Vaccina	21				1			
Variola								
Varioloides								
Total	66	1	1	1	27	2		1
Ratio per thousand	160. 19	2. 42	2. 42	2. 42	88. 52	6. 55		3. 27
Number of sick days	569				163			
Average number sick daily	1. 55				. 44			
Av. number sick daily per thousand ..	3. 76				1. 44			
Average duration of treatment	9. 03				6. 03			
II.—CONSTITUTIONAL DISEASES.								
Adynamia					3	1		
Anæmia	3	1						
Lumbago	6				7	1		
Podagra								
Rheumatismus acutus	13	4			7	2		
Rheumatismus chronicus	4		1		8	2		
Scrofula	1							
Senectus	1							
Syphilis primitiva	2				6	3		
Syphilis consecutiva	6	1			5	3		
Total	36	6	1		36	12		
Ratio per thousand	87. 37	14. 56	2. 42		118. 03	39. 34		
Number of sick days	589				385			
Average number sick daily	1. 61				1. 05			
Av. number sick daily per thousand ..	3. 90				3. 44			
Average duration of treatment	16. 36				10. 69			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	2				1			
Chorea	1	1			1	1		
Dementia	1		1					
Epilepsia	2		1					
Hysteria								
Insolatio								
Mania					2			
Melancholia								
Meningitis	1			1				
Nausea marina					1			
Neuralgia					2	1		

and dead, for each disease, on the North Atlantic Station.

Saratoga.				Tennessee.				Colorado.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
								2	1		
9	1			1							
				2	1						
4				14			1	12	3		
3				1							
				1	1						
				2							
5	5										
				8				3	1		
				1	1						
				3	3						
21	6			33	6		1	17	5		
73.42	20.97			70.06	12.73		2.12	62.5	18.38		
196				287				52			
.53				.78				.14			
1.85				1.65				.51			
9.36				8.69				3.05			
				5	1			2	1		
								1	1		
				3				3	2		
				3	1						
4				5	1			13	5		
				5	1			6	5		
9	2			8	2			5	5		
				15				4	4		
13	2			42	6			34	23		
45.45	6.99			89.17	12.73			125	84.55		
331				405				99			
.90				1.10				.27			
3.14				2.33				.99			
25.38				9.16				2.91			
1	1										
				3				2	2		
				3							
				2				1			
								1	1		
				3	2						
1											
				1				10	3		

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	New Hampshire.				Portsmouth.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES— Continued.								
I.—DISEASES OF THE NERVOUS SYSTEM— Continued.								
Pleurodynia					1			
Vertigo	1							
Total	8	1	2	1	8	2		
Ratio per thousand	19.41	2.42	4.85	2.42	26.22	6.55		
Number of sick days	70				46			
Average number sick daily	.19				.12			
Av. number sick daily per thousand ..	.46				.39			
Average duration of treatment	8.75				5.75			
II.—DISEASES OF THE EYE.								
Amaurosis	1							
Conjunctivitis	7	1			1			
Iritis	2							
Ophthalmia								
Retinitis					1			
Total	10	1			2			
Ratio per thousand	24.27	2.42			6.55			
Number of sick days	90				7			
Average number sick daily	.24				.01			
Av. number sick daily per thousand ..	.58				.03			
Average duration of treatment	9				3.5			
III.—DISEASES OF THE EAR.								
Otalgia	1							
Otititis	2	1			2	1		
Otorrhœa	3				1			
Surditas								
Total	6	1			3	1		
Ratio per thousand	14.56	2.42			9.83	3.27		
Number of sick days	48				12			
Average number sick daily	.13				.03			
Av. number sick daily per thousand ..	.31				.09			
Average duration of treatment	8				4			
IV.—DISEASES OF THE TEETH.								
Odontalgia								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment								

dead, for each disease, on the North Atlantic Station—Continued.

Saratoga. *				Tennessee.				Colorado.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
								1			
2	1			12	2			15	6		
6.99	3.49			25.47	4.24			55.14	22.05		
8				94				35			
.02				.25				.09			
.06				.53				.33			
4				7.83				2.33			
								1			
				1				3	1		
								1			
								1	1		
				1				6	2		
				2.12				22.05	7.31		
				3				52			
								.14			
								.51			
				3				8.66			
1				1							
				1	1						
1				2	1						
3.49				4.24	2.12						
2				69							
				.18							
				.38							
2				34.5							
								1			
								1			
								3.67			
								4			
								.01			
								.03			
								4			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	New Hampshire.				Portsmouth.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Angina pectoris								
Dilatatio cordis								
Hypertrophica cordis								
Morbi valvularum cordis	2	1	1					
Palpitatio	1				3	1		
Phlebitis								
Varix								
Total	3	1	1		3	1		
Ratio per thousand	7.27	2.42	2.42		9.83	3.27		
Number of sick days	5				48			
Average number sick daily	.01				.13			
Av. number sick daily per thousand ..	.02				.42			
Average duration of treatment	1.66				16			
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	23				17	3		
Bronchitis chronica	5				1	1		
Catarrhus	3		1		4			
Hæmoptysis					1			
Laryngitis	2				3	1		
Phthisis pneumonica chronica					4	3		
Pleuritis	1				1	1		
Pneumonia	3				1	1		
Total	37		1		32	10		
Ratio per thousand	89.80		2.42		104.90	32.78		
Number of sick days	502				314			
Average number sick daily	1.37				.86			
Av. number sick daily per thousand ..	3.32				2.81			
Average duration of treatment	13.56				9.81			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	3							
Colica	2							
Congestio hepatis	1							
Constipatio					1			
Diarrhœa acuta	9				2			
Diarrhœa chronica	2							
Dysenteria acuta					1			
Dysenteria chronica								
Dyspepsia	1							
Enteritis								
Gastritis					1			
Gastrodynia								
Hæmatemesis								
Hæmorrhoids	1				2			
Hepatitis acuta					1	1		
Hernia	3	1	1		8	4		
Icterus					1	1		
Pharyngitis	17							

dead, for each disease, on the North Atlantic Station—Continued.

Saratoga.				Tennessee.				Colorado.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
								1	1		
								1			
								1	1		
				1	1			1			
				2							
				1							
								1			
				4	1			5	2		
				8.49	2.12			18.38	7.31		
				20				19			
				.05				.05			
				.10				.18			
				5				3.8			
2				7							
1	1			2							
4				45				7	1		
1				1	1			2			
2	1		1	1				1	1		
1				4	3						
3											
14	2		1	60	4			10	2		
48.95	6.99		3.49	127.38	8.49			36.76	7.31		
245				349				34			
.67				.95				.09			
2.34				2.01				.33			
17.5				5.81				3.4			
				2				2			
				2				4	3		
6	1			17				16	5		
				1				1	1		
				2				1			
				1	1						
				2	1						
1								1	1		
				2							
				1							
				2				1	1		
2											
				1	1						
				1							
				1				1			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	New Hampshire.				Portsmouth.			
	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
Diseases and injuries.								
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.								
Prolapsus ani.....								
Tonsillitis	40				12	2		
Vermes	1				1	1		
Total.....	80	1	1		30	9		
Ratio per thousand.....	194.17	2.42	2.42		98.36	24.49		
Number of sick days	375				193			
Average number sick daily	1.02				0.52			
Av. number sick daily, per thousand..	2.47				1.70			
Average duration of treatment.....	4.68				6.43			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Balanitis								
Chancroides					3	1		
Cystitis					3	1		
Dysuria								
Enuresis	10	1	1		3	2		
Gonorrhœa	7				5	1		
Hydrocele					1	1		
Nephritis	1	1						
Orchitis	5				8	4		
Phymosis					1			
Urethræ strictura.....								
Varicocele	2							
Total.....	25	2	1		24	10		
Ratio per thousand.....	60.67	4.85	2.42		78.56	32.78		
Number of sick days	305				210			
Average number sick daily	.83				.57			
Av. number sick daily per thousand..	2.01				1.86			
Average duration of treatment.....	12.2				8.75			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....	1							
Synovitis.....	6		1					
Total.....	7		1					
Ratio per thousand.....	16.98		2.42					
Number of sick days.....	127							
Average number sick daily	.34							
Av. number sick daily per thousand..	.82							
Average duration of treatment.....	18.14							

dead, for each disease, on the North Atlantic Station—Continued.

Saratoga.				Tennessee.				Colorado.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1										
2				9				2			
								3	1		
12	2			44	3			32	12		
41. 96	6. 99			93. 41	6. 37			117. 69	44. 12		
111				351				92			
0. 30				0. 96				0. 25			
1. 04				2. 03				0. 91			
9. 25				7. 97				2. 87			
				15	1			1			
				1							
				1	1						
5				6				6	1		
				5				5	5		
1	1			1							
				2	1			1	1		
6	1			31	3			13	7		
20. 97	3. 49			65. 82	6. 37			47. 79	25. 69		
140				198				35			
. 38				. 54				. 09			
1. 32				1. 14				. 33			
23. 33				6. 38				2. 69			
				2	1			2	2		
				2	1			2	2		
				4. 24	2. 12			7. 31	7. 31		
				25				2			
				. 06							
				. 12							
				12. 5				1			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations.....	New Hampshire.				Portsmouth.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENT-ARY SYSTEM.								
Abscessus.....	13				12	2		
Anthrax.....								
Eczema.....					2			
Erythema.....	2							
Furunculus.....	13				9			
Herpes.....								
Impetigo.....					1			
Intertrigo.....	1							
Lichen.....					1			
Onychia.....	2				2			
Paronychia.....	4				6			
Pernio.....	2							
Prurigo.....	1	1						
Psoriasis.....	1	1						
Scabies.....	12	12						
Unguis involutus.....	1							
Ulcus.....	11	1	1		12	3		
Urticaria.....								
Total.....	63	15	1		45	5		
Ratio per thousand.....	152.91	36.40	2.42		147.54	16.39		
Number of sick-days.....	463				730			
Average number sick daily.....	1.26				2.			
Av. number sick daily per thousand...	3.05				6.55			
Average duration of treatment.....	7.34				16.22			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	4				5	1		
Lymphangitis.....					1			
Total.....	4				6	1		
Ratio per thousand.....	9.70				19.66	3.27		
Number of sick-days.....	35				74			
Average number sick daily.....	.09				.20			
Av. number sick daily per thousand...	.21				.65			
Average duration of treatment.....	8.75				12.33			
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Adenoma.....								
Total.....								
Ratio per thousand.....								
Number of sick-days.....								
Average number sick daily.....								
Av. number sick daily per thousand...								
Average duration of treatment.....								

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	New Hampshire.				Portsmouth.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
C.—POISONS.								
Alcoholismus	10	.....	.....	.....	1	.....	.....	.....
Colica pictorum	1	.....	.....	.....	.....	.....	.....	.....
Delirium tremens .....	.....	.....	.....	.....	1	1	.....	.....
Ebriositas .....	.....	.....	.....	.....	.....	.....	.....	.....
Total	11	.....	.....	.....	2	1	.....	.....
Ratio per thousand	26.69	.....	.....	.....	6.55	3.27	.....	.....
Number of sick days	42	.....	.....	.....	5	.....	.....	.....
Average number sick daily	.11	.....	.....	.....	.01	.....	.....	.....
Av. number sick daily per thousand ..	.26	.....	.....	.....	.03	.....	.....	.....
Average duration of treatment	3.81	.....	.....	.....	2.5	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	1	.....	.....	.....	3	.....	.....	.....
Ambustio	5	.....	.....	.....	6	1	.....	.....
Concussio cerebri	3	.....	.....	.....	1	.....	.....	1
Concussio spinalis .....	.....	.....	.....	.....	.....	.....	.....	.....
Congelatio	2	.....	.....	.....	2	1	.....	.....
Contusio	11	.....	.....	.....	12	.....	.....	.....
Fractura .....	.....	.....	.....	.....	2	1	.....	.....
Luxatio	1	.....	1	.....	1	1	.....	.....
Strenua	13	1	.....	.....	4	1	.....	.....
Submersio	1	.....	.....	1	.....	.....	.....	.....
Suicidium	1	.....	.....	1	.....	.....	.....	.....
Vulnus contusum	27	1	1	.....	3	2	.....	.....
Vulnus incisum	11	.....	.....	.....	5	.....	.....	1
Vulnus laceratum	9	.....	.....	.....	3	.....	.....	.....
Vulnus punctum	6	.....	.....	.....	.....	.....	.....	.....
Vulnus sclopetarium .....	.....	.....	.....	.....	.....	.....	.....	.....
Total	91	2	2	2	42	7	.....	2
Ratio per thousand.	220.87	4.85	4.85	4.85	137.70	22.95	.....	6.55
Number of sick days	912	.....	.....	.....	349	.....	.....	.....
Average number sick daily	2.49	.....	.....	.....	.95	.....	.....	.....
Av. number sick daily per thousand ..	6.04	.....	.....	.....	3.11	.....	.....	.....
Average duration of treatment	10.02	.....	.....	.....	8.30	.....	.....	.....
Grand total	447	31	12	4	260	61	.....	3
Ratio per thousand	1,084.92	75.24	29.13	9.71	852.45	200.	.....	9.83
Number of sick days	4,132	.....	.....	.....	2,536	.....	.....	.....
Average number sick daily	11.32	.....	.....	.....	6.94	.....	.....	.....
Av. number sick daily per thousand ..	27.47	.....	.....	.....	22.75	.....	.....	.....
Average duration of treatment	9.24	.....	.....	.....	9.75	.....	.....	.....

dead, for each disease, on the North Atlantic Station—Continued.

Saratoga.				Tennessee.				Colorado.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
				1				1			
								2	1		
								1			
				1				4	1		
				2 12				14. 62	3. 67		
				3				.10			
								.02			
								.07			
				3				2. 5			
1											
				5				2	1		
				1							
				2							
2				18				8	2		
1				3	2			3	3		
1	1							2	1		
2				8				12	3		
				1			1				
2				5				4			
1				6				1			
3				5				4	1		
				1							
				1	1						
13	1			56	3		1	36	11		
45. 45	3. 49			118. 89	6. 37		2. 12	132. 31	40. 44		
290				682				128			
. 79				1. 86				. 35			
2. 76				3. 94				1. 28			
22. 30				12. 17				3. 27			
120	18		1	327	34		2	203	79		
419. 58	62. 93		3. 49	694. 26	72. 18		4. 24	746. 32	253. 67		
1, 729				2, 931				729			
4. 73				8. 03				1. 99			
16. 53				17. 04				7. 31			
14. 40				8. 96				3. 59			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Febricula	2							
Febris enterica	12	1			6			
Febris intermittens	12	2			1			
Febris remittens	2							
Vaccina								
Total	28	3			7			
Ratio per thousand	111.55	11.95			28.22			
Number of sick days	212				12			
Average number of sick daily	.58				.03			
Av. number sick daily per thousand	2.31				.12			
Average duration of treatment	7.57				1.71			
II.—CONSTITUTIONAL DISEASES.								
Adynamia	1	1			3			
Anæmia								
Lumbago	1							
Rheumatismus acutus	5	1			22	4		
Rheumatismus chronicus	3	1			7	1		
Syphilis primitiva	1				1	1		
Syphilis consecutiva	2	1			1			
Total	13	4			34	6		
Ratio per thousand	51.79	15.93			137.09	24.19		
Number of sick days	125				294			
Average number sick daily	.34				.80			
Av. number sick daily per thousand	1.35				3.22			
Average duration of treatment	9.61				8.64			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia								
Cephalalgia					5			
Convulsio								
Epilepsia								
Hysteria								
Insolatio								
Melancholia								
Meningitis					1	1		
Nausea marina					12			
Neuralgia	1				10			
Neuritis								
Pleurodynia								
Vertigo								
Total	1				28	1		
Ratio per thousand	3.98				112.90	4.03		
Number of sick days	8				253			
Average number sick daily	.02				.69			
Av. number sick daily per thousand	.07				2.78			
Average duration of treatment	8.				9.03			

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
2											
1	1										
7				7				6			
1	1							2			
				2							
11	2			9				8			
55	10			45				41.02			
33				31				110			
.09				.08				.30			
.45				.40				1.53			
3				3.44				13.75			
6	2			1				3			
1				2				2	1		
1				7	2			4			
2	1			1				4	1		
12	4			2	1			1			
10	2			2	2			2	2		
3											
35	9			15	5			16	4		
175	45			75	25			82.05	20.51		
397				182				112			
1.08				.49				.30			
5.40				2.45				1.53			
11.31				12.13				7			
1				1				2	1		
1				1				1	1		
1				1				1	1		
1											
1								1	1		
1											
4				2	1			2			
1								2			
3											
13								9	4		
.65				.25	5			40.15	20.51		
63				15				68			
.17				.04				.18			
.85				.20				.92			
4.84				.3				7.55			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Asthenopia					1	1		
Conjunctivitis	3				2			
Hordeolum	1							
Ophthalmia								
Retinitis								
Ulcer cornea	2							
Total	6				3	1		
Ratio per thousand	23.89				12.09	4.03		
Number of sick days	56				14			
Average number of sick daily	.15				.03			
Av. number sick daily per thousand ..	.59				.12			
Average duration of treatment	9.33				4.66			
III.—DISEASES OF THE EAR.								
Otalgia					1			
Otititis	1				2			
Otorrhœa								
Surditas					1			
Total	1				4			
Ratio per thousand	3.98				16.12			
Number of sick days	3				20			
Average number sick daily					.05			
Av. number sick daily per thousand ..					.20			
Average duration of treatment	3				5			
IV.—DISEASES OF THE TEETH.								
Odontalgia					1			
Total					1			
Ratio per thousand					4.03			
Number of sick days					1			
Average number sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment					1			
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysm	1			1				
Morbi valvularum cordis	1	1						
Palpitatio								
Total	2	1		1				
Ratio per thousand	7.96	3.98		3.98				
Number of sick days	53							
Average number sick daily	.14							
Av. number sick daily per thousand ..	.55							
Average duration of treatment	26.5							

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1								1	1		
1	1			1	1						
2	1			2	2						
10.	.5			3	3			1	1		
4				15.	15			5.12	5.12		
.01				12				1			
.05				.03							
2				.15							
				4				1			
				3							
				3							
				15.							
				16							
				.04							
				5.33							
1				1							
1				1							
5				5							
4				4							
.01				.01							
.05				.05							
4				4							
								1			1
								5	3		
								6	3		1
								30.76	15.38		5.12
								51			
								14			
								.71			
								8.5			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	3	1						
Bronchitis acuta	3				50	13		
Bronchitis chronica	2	1			5	2		
Catarrhus	6				11			
Epistaxis								
Laryngitis	3							
Phthisis pneumonica acuta								
Phthisis pneumonica chronica	1	1			1	1		
Pleuritis					1	1		
Pneumonia	1	1						
Total	19	4			68	17		
Ratio per thousand	75.69	15.93			274.19	68.54		
Number of sick days	89				426			
Average number sick daily	.24				1.16			
Av. number sick daily per thousand...	.95				4.67			
Average duration of treatment.....	4.68				6.26			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	2				1			
Colica	2				8			
Constipatio								
Diarrhœa acuta	4				8			
Dysenteria chronica.....	2	1						
Dyspepsia					1			
Fistula in ano								
Gastritis					1			
Hæmorrhoids.....	2	1						
Hernia	2	1			3	1		
Pharyngitis								
Prolapsus ani	2	1						
Tonsillitis	4				16	4		
Total.....	20	4			38	5		
Ratio per thousand.....	79.67	15.93			153.21	20.15		
Number of sick days	79				256			
Average number sick daily.....	.21				.70			
Av. number sick daily per thousand...	.83				2.82			
Average duration of treatment	3.95				6.73			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Chancroides								
Cystitis								
Enuresis					1			
Epididymitis								
Gonorrhœa	1				1			
Hydrocele	1							
Nephritis					1			1
Orchitis	3				2			
Phymosis	1							

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1								1			
2				5				7			
								4	4		
5				3							
1				3							
								1			
1	1			1	1			2	2		
1											
11	1			12	1			15	6		
55	5			60	5			76.93	30.76		
46				54				210			
.12				.14				.57			
.60				.70				2.92			
4.18				4.5				14			
2								1			
4				3							
10				7				10			
1				1				2	1		
								1	1		
1				1				4	1		
1								1	1		
2				9				4			
4				2				3			
25				23				27	4		
125.				115.				138.46	20.51		
101				78				135			
.27				.21				.36			
1.35				1.05				1.84			
4.04				3.39				5.			
5				3							
1											
1											
5				2		1		1			
3	1										
4								1			
				1							

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO- URINARY SYSTEM—Continued.								
Urethræ strictura					1			
Varicocele								
Total.....	6				6			1
Ratio per thousand.....	23.89				24.19			4.03
Number of sick days	49				58			
Average number sick daily.....	.13				.15			
Av. number sick daily per thousand...	.51				.60			
Average duration of treatment	8.16				9.66			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Synovitis.....								
Total.....								
Ratio per thousand.....								
Number of sick days								
Average number sick daily.....								
Av. number sick daily per thousand ..								
Average duration of treatment.....								
X.—DISEASES OF THE INTRGUMENT- ARY SYSTEM.								
Abscessus.....	4				13			
Acne					1			
Anthrax	1	1			1			
Cellulitis								
Eczema	1	1			1			
Furunculus	16				2			
Herpes					1			
Impetigo								
Lichen					1			
Onychia					1			
Paronychia.....	4				4			
Pemphigus								
Pernio					2			
Tinea	1							
Unguis involutus								
Ulcus	8				1			
Urticaria.....	1							
Total.....	36	2			28			
Ratio per thousand.....	143.42	7.96			112.90			
Number of sick days	272				218			
Average number sick daily	.74				.59			
Av. number sick daily per thousand.	2.90				2.37			
Average duration of treatment.....	7.55				7.88			

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1								2	2		
1											
21	1			6		1		4	2		
105	5			30		5		20.51	10.25		
338				125				27			
.92				.34				.07			
4.60				1.70				.35			
16.09				20.83				6.75			
1				1	1						
1				1	1						
5				5	5						
14				7							
.03				.01							
.15				.05							
14				7							
9				4	1						
4											
5											
6				15				3			
1											
1	1										
6				7	1			1			
				1							
				2							
10				1				3			
				1							
42	1			31	2			7			
210	5			155	10			35.89			
563				268				90			
1.54				.73				.24			
7.70				3.65				1.23			
13.40				8.64				12.85			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	3				1			
Total.....	3				1			
Ratio per thousand.....	11.95				4.03			
Number of sick days	113				48			
Average number sick daily	.30				.13			
Av. number sick daily per thousand...	1.19				.52			
Average duration of treatment.....	37.66				48.			
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Cystis					2			
Polypus.....					1	1		
Total.....					3	1		
Ratio per thousand.....					12.09	4.03		
Number of sick days.....					15			
Average number sick daily					.04			
Av. number sick daily per thousand...					.16			
Average duration of treatment.....					5			
C.—POISONS.								
Alcoholismus	3							
Delirium tremens					1			
Ebriositas.....	1							
Total	4				1			
Ratio per thousand.....	15.93				4.03			
Number of sick days	31				2			
Average number sick daily.....	.08							
Av. number sick daily per thousand...	.31							
Average duration of treatment.....	7.75				2			
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	2				3			
Ambustio	3				2			
Concussio cerebri								
Congelatio	2	1						
Contusio	7				20			
Fractura	5	1			1	1		
Luxatio								
Stremma	8	1			14			
Vulnus contusum					5			

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
7	1	.....	.....	2	1	.....	.....	1	1	.....	.....
7	1	.....	.....	2	1	.....	.....	1	1	.....	.....
35	5	.....	.....	10	5	.....	.....	5.12	5.12	.....	.....
179				8	.....	.....	.....	4	.....	.....	.....
.49				.02	.....	.....	.....	.01	.....	.....	.....
2.45				.10	.....	.....	.....	.05	.....	.....	.....
25.58				4	.....	.....	.....	4	.....	.....	.....
1											
1											
5											
8											
.02											
.10											
.8											
9				3	.....	.....	.....	.....	.....	.....	.....
9				3	.....	.....	.....	.....	.....	.....	.....
45				15	.....	.....	.....	.....	.....	.....	.....
18				6	.....	.....	.....	.....	.....	.....	.....
.04				.01	.....	.....	.....	.....	.....	.....	.....
.20				.05	.....	.....	.....	.....	.....	.....	.....
2				2	.....	.....	.....	.....	.....	.....	.....
1				2	.....	.....	.....	1	.....	.....	.....
3				5	.....	.....	.....	1	1	.....	.....
.....				1	1	.....	.....	1	.....	.....	.....
7	1	.....	.....	10	.....	.....	.....	3	.....	.....	.....
1				2	1	.....	.....	1	1	.....	.....
4											
3				2	.....	.....	.....	1	.....	.....	.....
3				4	.....	.....	.....	5	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Powhatan.				Jamestown.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS—Continued.								
Vulnus incisum	3				3			
Vulnus laceratum	5	1						
Vulnus punctum					1			
Vulnus sclopetarium								
Total	35	4			49	1		
Ratio per thousand	139.44	15.93			197.58	4.03		
Number of sick days	358				317			
Average number sick daily	.98				.84			
Av. number sick daily per thousand ..	3.90				3.39			
Average duration of treatment.....	10.22				6.46			
Grand total.....	174	22		1	271	32		1
Ratio per thousand	693.22	87.64		3.98	1,092.74	129.03		4.03
Number of sick days	1,448				1,933			
Average number sick daily	3.96				5.25			
Av. number sick daily per thousand...	15.77				21.17			
Average duration of treatment.....	8.32				7.12			

dead, for each disease, on the North Atlantic Station—Continued.

Kearsarge.				Minnesota.				Vandalia.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
4				5				2			
1				3				1			
1											
28	1			34	2			21	2		
140	5			170	10			107.68	10.25		
222				182				146			
.60				.49				.40			
3				2.45				2.05			
7.92				5.35				6.95			
207	17			148	16	1		115	26		1
1,035	85			740	80	5		589.74	133.33		5.12
1,990				988				934			
5.45				2.70				2.61			
27.25				13.5				13.38			
9.61				6.67				8.29			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Franklin.				Alliance.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Catarrhus epidemicus					•			
Febricula					6			
Febris cerebro-spinalis								
Febris continua simplex								
Febris intermittens	32				6			
Febris remittens	16	3						
Parotitis	1	1						
Roseola	1							
Vaccina	2				2			
Varioloides	1	1						
Total	53	5			14			
Ratio per thousand	286.48	27.02			81.39			
Number of sick days	206				69			
Average number sick daily	.56				.18			
Av. number sick daily per thousand ..	3.02				1.04			
Average duration of treatment	3.88				4.92			
II.—CONSTITUTIONAL DISEASES.								
Adynamia	1	1			2	2		
Lumbago	1							
Rheumatismus acutus	2	1			16			
Rheumatismus chronicus	2	1			13	2		
Senectus					1	1		
Syphilis primitiva					3	1		
Syphilis consecutiva					3			
Torticollis	1							
Total	7	3			38	6		
Ratio per thousand	37.84	16.21			226.74	34.88		
Number of sick days	54				411			
Average number sick daily	.14				1.12			
Av. number sick daily per thousand ..	.75				6.51			
Average duration of treatment	7.71				10.81			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia					17			
Cerebritis								
Dementia					1	1		
Epilepsia								
Insomnia								
Nausea marina					8			
Neuralgia	6	1			4			
Pleurodynia								
Vertigo	1							
Total	7	1			30	1		
Ratio per thousand	37.84	5.40			174.41			
Number of sick days	28				84			
Average number sick daily	.07				.23			
Av. number sick daily per thousand...	.37				1.33			
Average duration of treatment	4				2.8			

dead, for each disease, on the North Atlantic Station—Continued.

Enterprise.				Yantic.				Tallapoosa.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
3	1							3	1		
3	1							2			
20				6				1	1		
								28	1		
								2			
8								4			
1	1										
35	3			6				40	3		
195.53	16.75			42.55				320	24		
152				24				181			
.42				.06				.49			
2.34				.42				3.92			
4.34				4				4.41			
3	3							5	2		
5	1			4							
6				1				10	4		
3				2				12	6		
5	2							5	2		
1	1			4	1			5	2		
23	7			11	1			37	16		
128.49	39.44			78.01	7.09			296	128		
210				128				292			
.59				.35				.80			
3.29				2.48				6.40			
9.13				11.63				7.89			
6								3			
1	1							1	1		
2	2										
1	1										
8								1			
9	1			3				5			
2	1										
1				1				1			
39	6			4				11	1		
167.59	33.50			28.36				88	8		
124				22				51			
.35				.06				.13			
1.95				.42				1.04			
4.13				5.5				4.63			

TABLE III.—Showing the number of cases the invalided and

Vessels or stations	Franklin.				Alliance.			
	Invalided.				Invalided.			
Diseases and injuries..	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Conjunctivitis.....					5			
Iritis.....								
Keratitis.....								
Sclerotitis.....								
Ulcer cornea.....	3	2						
Total.....	3	2			5			
Ratio per thousand.....	16.21	10.80			29.07			
Number of sick days.....	19				22			
Average number sick daily.....	.05				.06			
Av. number sick daily per thousand.....	.25				.34			
Average duration of treatment.....	6.33				4.4			
III.—DISEASES OF THE EAR.								
Otalgia.....								
Otititis.....	1							
Otorrhœa.....								
Total.....	1							
Ratio per thousand.....	5.40							
Number of sick days.....	3							
Average number sick daily.....								
Av. number sick daily per thousand.....								
Av. duration of treatment.....	3							
IV.—DISEASES OF THE TEETH.								
Odontalgia.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
Average number sick daily.....								
Av. number sick daily per thousand.....								
Average duration of treatment.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Morbi valvularium cordis.....	1	1						
Palpitatio.....					2			
Syncope.....								
Total.....	1	1			2			
Ratio per thousand.....	5.40	5.40			11.62			
Number of sick days.....	7				21			
Average number sick daily.....	.01				.05			
Av. number sick daily per thousand.....	.05				.29			
Average duration of treatment.....	7				10.05			

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dead, for each disease, on the North Atlantic Station—Continued.

Enterprise.				Yantic.				Tallapoosa.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
				1				2			
				1				2	1		
1											
1											
3				4				4	1		
16.75				14.18				32	8		
96				17				23			
.26				704				.06			
1.45				.28				.48			
32				8.5				5.75			
2	1										
1								5	1		
3	1							5	1		
16.75	5.58							40	8		
.33								.39			
.09								.10			
.50								.80			
11								7.8			
1											
1											
5.58											
5											
.01											
.05											
5											
1				1							
								1			
1				1				1			
5.58				7.09				8			
7				15				3			
.01				.04							
.05				.28							
7				15				3			

TABLE III.—Showing the number of cases the invalided and

Vessels or stations	Franklin.				Alliance.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	1							
Bronchitis acuta	4				2			
Bronchitis chronica	3	2			1	1		
Catarrhus	4				16			
Epistaxis					1	1		
Hæmoptysis								
Laryngitis					2			
Phthisis pneumonica, acuta					1	1		
Phthisis pneumonica, chronic	1	1			1	1		
Pleuritis					1	1		
Total.....	13	3			25	5		
Ratio per thousand	70.27	16.21			145.34	29.07		
Number of sick days	79				128			
Average number sick daily	.21				.35			
Av. number sick daily per thousand...	1.13				2.03			
Average duration of treatment.....	6.07				5.12			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus					1			
Colica	1				11			
Congestio hepatis								
Constipatio								
Diarrhæa acuta	5				8			
Diarrhæa chronica	1							
Dysentæria acuta	2	1			1			
Dysentæria chronica								
Dyspepsia	1				1	1		
Fistula in ano	1	1						
Hæmatemesis	1							
Hæmorrhoids	3				3	1		
Icterus	1	1						
Pharyngitis								
Tonsillitis	2				5			
Total.....	18	3			30	2		
Ratio per thousand	97.29	16.21			174.41	4.62		
Number of sick-days	71				128			
Average number sick daily	.19				.35			
Av. number sick daily per thousand ..	1.02				2.03			
Average duration of treatment.....	3.94				4.26			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Balanitis	1				1			
Chancroides	3	2	1		11			
Cystitis	1							
Gonorrhœa	8	2			9			
Hydrocele					2	1		
Orchitis	3				1			
Paraphymosis								
Prostatitis					1	1		

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Franklin.				Alliance.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO- URINARY SYSTEM—Continued.								
Urethræ stricturæ	1							
Varicocele	1							
Total.....	18	4	1		25	2		
Ratio per thousand.....	97.29	21.61	5.40		145.34	11.62		
Number of sick days	182				281			
Average number sick daily	.49				.76			
Av. number sick daily per thousand ..	2.64				4.41			
Average duration of treatment.....	10.11				11.24			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ostitis								
Synovitis.....	1							
Total.....	1							
Ratio per thousand.....	5.40							
Number of sick days	4							
Average number sick daily.....	.01							
Av. number sick daily per thousand ..	.05							
Average duration of treatment.....	4							
X.—DISEASES OF THE INTEGUMENT- ARY SYSTEM.								
Abscessus.....	9	1			11	1		
Eczema					2			
Erythema								
Furunculus	1				9			
Impetigo								
Onychia								
Paronychia.....								
Pernio								
Psoriasis	1							
Unguis involutis	1							
Ulcus	1	1			1			
Total.....	13	2			23	1		
Ratio per thousand.....	70.27	10.81			133.72	5.81		
Number of sick days	130				139			
Average number of sick daily	.35				.38			
Av. number sick daily per thousand ..	1.89				2.20			
Average duration of treatment.....	10				6.04			

dead, for each disease, on the North Atlantic Station—Continued.

Enterprise.				Yantic.				Tallapoosa.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1											
11	4	.....	.....	8	.....	.....	.....	7	.....	.....	.....
61.44	22.34	.....	.....	56.72	.....	.....	.....	56	.....	.....	.....
96				75	.....	.....	.....	49	.....	.....	.....
.27				.20	.....	.....	.....	.13	.....	.....	.....
1.50				1.40	.....	.....	.....	1.04	.....	.....	.....
8.72				9.37	.....	.....	.....	7	.....	.....	.....
.....											
.....				1	.....	.....	.....	.....	.....	.....	.....
.....											
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				7.09	.....	.....	.....	.....	.....	.....	.....
.....				54	.....	.....	.....	.....	.....	.....	.....
.....				.14	.....	.....	.....	.....	.....	.....	.....
.....				.98	.....	.....	.....	.....	.....	.....	.....
.....				54	.....	.....	.....	.....	.....	.....	.....
.....											
5				1	.....	.....	.....	4	.....	.....	.....
1								1	1	.....	.....
3				10	.....	.....	.....	10	.....	.....	.....
1								1	.....	.....	.....
1								1	.....	.....	.....
2								1	.....	.....	.....
.....								1	.....	.....	.....
5				2	.....	.....	.....	3	.....	.....	.....
18				13	.....	.....	.....	21	1	.....	.....
100.89				92.19	.....	.....	.....	168	8	.....	.....
125				67	.....	.....	.....	150	.....	.....	.....
.35				.18	.....	.....	.....	.41	.....	.....	.....
1.95				1.27	.....	.....	.....	3.28	.....	.....	.....
6.94				5.15	.....	.....	.....	7.14	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Franklin.				Alliance.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases,	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	4				7			
Total	4				7			
Ratio per thousand	.21				40.70			
Number of sick days	38				89			
Average number of sick daily	.10				.24			
Av. number sick daily per thousand ..					1.39			
Average duration of treatment	9.5				12.71			
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Fibroma	1							
Total	1							
Ratio per thousand								
Number of sick days	3							
Average number sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment	3							
C.—POISONS.								
Alcoholismus	1				9			
Vulnus venenatum								
Total	1				9			
Ratio per thousand	5.40				52.32			
Number of sick days	4				38			
Average number sick daily	.01				.10			
Av. number sick daily per thousand ...	.05				.58			
Average duration of treatment	4				4.22			
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	1				3			
Ambustio					1			
Concussio cerebri	2							
Congelatio					1			
Contusio	2				27			
Fractura								
Luxatio					1			
Stremma	7	2			12			
Submersio								
Vulnus contusum	1				7			

dead, for each disease, on the North Atlantic Station—Continued.

Enterprise.				Yantic.				Tallapoosa.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1				4	1	.....	.....	2	2	.....	.....
1				4	1	.....	.....	2	2	.....	.....
5.58				28.36	7.09	.....	.....	.....	.....	.....	.....
28				42	.....	.....	.....	16	.....	.....	.....
.07				.11	.....	.....	.....	.04	.....	.....	.....
.39				.78	.....	.....	.....	.32	.....	.....	.....
28				10.5	.....	.....	.....	8	.....	.....	.....
.....											
.....								1	.....	.....	.....
.....								1	.....	.....	.....
.....								8	.....	.....	.....
.....								5	.....	.....	.....
.....								.01	.....	.....	.....
.....								.08	.....	.....	.....
.....								5	.....	.....	.....
.....											
5	1	.....	.....	1	.....	.....	.....	4	1	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....
5	1	.....	.....	3	.....	.....	.....	4	1	.....	.....
28.27	5.58	.....	.....	27.21	.....	.....	.....	32	8	.....	.....
6				9	.....	.....	.....	13	.....	.....	.....
.01				.02	.....	.....	.....	.03	.....	.....	.....
.07				.14	.....	.....	.....	.24	.....	.....	.....
1.2				3	.....	.....	.....	3.25	.....	.....	.....
.....											
3				1	.....	.....	.....	3	.....	.....	.....
3								4	.....	.....	.....
2	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
14				7	1	.....	.....	3	.....	.....	.....
1								1	.....	.....	.....
3											
8				7	1	.....	.....	9	1	.....	.....
.....								1	.....	.....	.....
1				2	.....	.....	.....	8	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Franklin.				Alliance.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS—Continued.								
Vulnus incisum	2							
Vulnus laceratum	4							
Vulnus punctum								
Total	19	2			52			
Ratio per thousand	102. 69	10. 81			302. 32			
Number of sick days	126				353			
Average number sick daily	. 34				. 96			
Av. number sick daily per thousand ..	1. 83				5. 58			
Average duration of treatment	6. 63				6. 78			
Grand total	160	26	1		260	17		
Ratio per thousand	864. 86	140. 54	5. 40		1, 511. 62	98. 83		
Number of sick days	954				1, 763			
Average number sick daily	2. 61				4. 83			
Av. number sick daily per thousand ...	14. 10				28. 08			
Average duration of treatment	5. 96				6. 78			

dead, for each disease, on the North Atlantic Station—Continued.

Enterprise.				Yantic.				Tallapoosa.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
2	1	.....	.....	1	.....	.....	.....	2	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
2	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....
43	2	.....	1	19	2	.....	.....	36	1	.....	1
240.56	11.17	.....	5.58	134.75	14.18	.....	.....	288	8	.....	8
323	.....	.....	.....	103	.....	.....	.....	203	.....	.....	.....
.91	.....	.....	.....	.28	.....	.....	.....	.55	.....	.....	.....
5.08	.....	.....	.....	1.98	.....	.....	.....	4.40	.....	.....	.....
7.51	.....	.....	.....	5.42	.....	.....	.....	5.63	.....	.....	.....
253	39	.....	1	88	7	.....	.....	198	31	.....	1
1,413.40	217.87	.....	5.58	624.11	49.65	.....	.....	1,584	248	.....	8
1,747	.....	.....	.....	629	.....	.....	.....	1,185	.....	.....	.....
4.93	.....	.....	.....	1.72	.....	.....	.....	3.24	.....	.....	.....
27.54	.....	.....	.....	12.19	.....	.....	.....	26.77	.....	.....	.....
6.90	.....	.....	.....	7.14	.....	.....	.....	5.98	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Wabash.				Wyoming.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febricula								
Febris enterica	1	1						
Febris intermittens					9			
Febris remittens	3				3			
Morbilli	1	1						
Vaccina					3			
Total	5	2			15			
Ratio per thousand	42. 01	16. 80			136. 36			
Number of sick days	11				72			
Average number sick daily	. 03				. 20			
Av. number sick daily per thousand ..	. 25				1. 99			
Average duration of treatment	2. 2				4. 8			
II.—CONSTITUTIONAL DISEASES.								
Adynamia	4	3						
Carcinoma	1	1						
Lumbago					2			
Podagra					1			
Rheumatismus acutus	2				2			
Rheumatismus chronicus	1	1						
Syphilis primitiva	7	4			5			
Syphilis consecutiva	3	2			2			
Total	18	11			12			
Ratio per thousand	151. 26	92. 43			109. 09			
Number of sick days	55				152			
Average number sick daily	. 15				. 43			
Av. number sick daily per thousand ..	1. 26				4. 29			
Average duration of treatment	3. 05				12. 66			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia	1							
Cephalalgia								
Convulsio								
Dementia	1	1						
Epilepsia								
Hysteria								
Mania	1	1						
Neuralgia	2				1			
Paralysis	1	1						
Pleurodynia	1							
Sciatica								
Vertigo	1							
Total	8	3			1			
Ratio per thousand	67. 22	25. 20			9. 99			
Number of sick days	35				2			
Average number sick daily	. 09							
Av. number sick daily per thousand ..	. 75							
Average duration of treatment	4. 37				2			

dead, for each disease, on the North Atlantic Station—Continued.

St. Louis.				Michigan.				Wyandotte.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1			1							
				2	1						
40	5			3				13	9		
1	1			2							
1	1										
8											
51	8			8	1			13	9		
418.03	64.57			87.92	10.98			191.17	132.35		
184				149				26			
.50				.40				.07			
4.09				4.39				1.02			
3.60				18.62				2			
1											
1											
5				2							
1				1				1	1		
2	2			2				2			
10	2			5				3	1		
81.96	16.39			54.95				44.11	14.70		
138				68				22			
.37				.18				.06			
3.03				1.97				.88			
13.80				13.6				7.33			
1	1							1	1		
				2		2					
1	1										
				1							
1											
8	2			3		2		1	1		
24.59	16.39			32.96		21.97		14.70	14.70		
5				54				1			
.01				.14							
.08				1.53							
1.66				18				1			

TABLE III.—Showing the number of cases the invalided and

Vessels or stations	Wabash.				Wyoming.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Conjunctivitis.....	2	1	.....	.....	2	.....	.....	.....
Hordeolum.....	1	.....	.....	.....	.....	.....	.....	.....
Iritis.....	.....	.....	.....	.....	2	1	.....	.....
Retinitis.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	3	1	.....	.....	4	1	.....	.....
Ratio per thousand.....	25.20	8.40	.....	.....	36.36	9.99	.....	.....
Number of sick days.....	9	.....	.....	.....	16	.....	.....	.....
Average number sick daily.....	.02	.....	.....	.....	.04	.....	.....	.....
Av. number sick daily per thousand..	.16	.....	.....	.....	.39	.....	.....	.....
Average duration of treatment.....	3	.....	.....	.....	4	.....	.....	.....
III.—DISEASES OF THE EAR.								
Otitis.....	1	.....	.....	.....	.....	.....	.....	.....
Total.....	1	.....	.....	.....	.....	.....	.....	.....
Ratio per thousand.....	8.40	.....	.....	.....	.....	.....	.....	.....
Number of sick days.....	5	.....	.....	.....	.....	.....	.....	.....
Average number sick daily.....	.01	.....	.....	.....	.....	.....	.....	.....
Av. number sick daily per thousand...	.08	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	5	.....	.....	.....	.....	.....	.....	.....
IV.—DISEASES OF THE TEETH.								
Odontalgia.....	1	.....	.....	.....	.....	.....	.....	.....
Total.....	1	.....	.....	.....	.....	.....	.....	.....
Number of sick days.....	1	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	1	.....	.....	.....	.....	.....	.....	.....
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma.....	2	2	.....	.....	.....	.....	.....	.....
Total.....	2	2	.....	.....	.....	.....	.....	.....
Ratio per thousand.....	16.80	16.80	.....	.....	.....	.....	.....	.....
Number of sick days.....	2	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	1	.....	.....	.....	.....	.....	.....	.....
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta.....	2	.....	.....	.....	1	.....	.....	.....
Bronchitis chronica.....	3	1	.....	.....	.....	.....	.....	.....
Catarrhus.....	4	.....	.....	.....	2	.....	.....	.....
Hæmoptysis.....	.....	.....	.....	.....	.....	.....	.....	.....
Laryngitis.....	.....	.....	.....	.....	.....	.....	.....	.....
Phthisis pneumonica, chronic.....	1	1	.....	.....	.....	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Wabash.				Wyoming.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM—Continued.								
Pleuritis								
Pneumonia								
Total	10	2			3			
Ratio per thousand	84.03	16.80			27.27			
Number of sick days	72				6			
Average number sick daily	19				.01			
Av. number sick daily per thousand ..	1.59				.09			
Average duration of treatment	7.20				2			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus					3			
Colica	2				4			
Congestio hepatis					2			
Constipatio	1				1			
Diarrhœa acuta	3							
Diarrhœa chronica								
Dysentery acuta								
Dyspepsia	1							
Enteritis								
Fistula in ano	1	1						
Gastritis								
Gastrodynia								
Hæmorrhoids					1			
Peritonitis	1	1						
Pharyngitis					2			
Tonsillitis	9	1						
Total	18	3			13			
Ratio per thousand	151.26	25.20			118.18			
Number of sick	59				27			
Average number sick daily	.16				.07			
Av. number sick daily per thousand ..	1.34				.69			
Average duration of treatment	3.27				2.07			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria	1	1						
Chancroides								
Enuresis								
Gonorrhœa					2			
Nephritis								
Orchitis					2			
Varicocele	1							
Total	2	1			4			
Ratio per thousand	16.80				36.36			
Number of sick days	5				51			
Average number sick daily	.01				.14			
Av. number sick daily per thousand ..	.08				1.39			
Average duration of treatment	2.5				12.75			

dead, for each disease, on the North Atlantic Station—Continued.

St. Louis.				Michigan.				Wyandotte.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1										
1	1			2	1		1				
8	4			20	1		1	1			
65.58	32.79			219.78	10.98		10.98	14.70			
27				150				11			
.07				.41				.03			
.57				4.50				.44			
3.37				7.5				11			
				2							
2				1	1						
5	2			2							
1	1										
1	1										
1											
1											
1											
1											
1				2							
				1							
				6				2			
12	4			14	1			2			
98.35	32.79			153.86	10.98			29.41			
34				69				7			
.09				.18				.01			
.73				1.97				.14			
2.83				4.92				3.5			
1	1										
1								1	1		
1											
2								1	1		
1	1										
1											
7	2							2	2		
57.38	16.39							29.41	29.41		
47								2			
.12											
.98											
6.71								1			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Wabash.				Wyoming.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ostitis	1	1						
Synovitis.....	1	1						
Total.....	2	2						
Ratio per thousand.....	16.80	16.80						
Number of sick days.....	15							
Average number sick daily.....	.04							
Av. number sick daily per thousand...	.33							
Average duration of treatment.....	7.5							
X.—DISEASES OF THE INTEGUMENT-ARY SYSTEM.								
Abscessus.....					4			
Anthrax.....								
Cellulitis.....								
Eczema.....								
Furunculus.....	3				1			
Paronychia.....					1			
Ulcer.....	1	1			1			
Total.....	4	1			7			
Ratio per thousand.....	33.61	8.40			63.63			
Number of sick days.....	42				58			
Average number sick daily.....	.11				.16			
Av. number sick daily per thousand ..	.92				1.59			
Average duration of treatment	10.5				8.28			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis					2			
Total.....					2			
Ratio per thousand					18.18			
Number of sick days					51			
Average number sick daily.....					.14			
Av. number sick daily per thousand....					1.39			
Average duration of treatment.....					25.5			
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Fibroma.....								
Total.....								
Ratio per thousand.....								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand....								
Average duration of treatment.....								

dead, for each disease, on the North Atlantic Station—Continued.

St. Louis.				Michigan.				Wyandotte.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1			1							
1	1			1							
8.19	8.19			10.98							
7				16							
.01				.04							
.08				.43							
7				16							
				5							
				1							
				1	1						
1											
2											
1				3							
1											
5				10	1						
40.98				109.89	10.98						
56				63							
.15				.17							
1.22				1.86							
11.2				6.30							
1	1							1			
1	1							1			
8.19	8.19							14.70			
1								11			
								.03			
								.44			
1								11			
				2	1		1				
				2	1		1				
				21.97	10.98		10.98				
				27							
				.07							
				.76							
				13.5							

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Wabash.				Wyoming.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
C.—POISONS.								
Alcoholismus	3	1			3			
Delirium tremens	2	1						
Ebriositas	2							
Total	7	2			3			
Ratio per thousand	58.82	16.80			27.27			
Number of sick days	7				12			
Average number sick daily	.01				.03			
Av. number sick daily per thousand	.08				.29			
Average duration of treatment	1				4			
D.—VIOLENT DISEASES AND DEATHS.								
Ambustio	1				1			
Concussio cerebri								
Contusio	7				8			
Fractura	2	2			1			
Luxatio					1			
Stremma	2				5			
Submersio								
Vulnus contusum	1				3			
Vulnus incisum	1							
Vulnus laceratum					1			
Vulnus punctum	1				1			
Vulnus sclopetarium					1			
Total	15	2			22			
Ratio per thousand	126.05	16.80			200			
Number of sick days	98				98			
Average number sick daily	.26				.28			
Av. number sick daily per thousand	2.18				2.79			
Average duration of treatment	6.53				4.45			
Grand total	96	32			86	1		
Ratio per thousand	806.72	168.89			781.81	9.99		
Number of sick days	416				550			
Average number sick daily	1.13				1.58			
Av. number sick daily per thousand	9.49				14.36			
Average duration of treatment	4.37				6.39			

dead, for each disease, on the North Atlantic Station—Continued.

St. Louis.				Michigan.				Wyandotte.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1											
								1			
1								1			
8.19								14.70			
2								1			
2								1			
1	1										
2				6							
3				3							
				1			1				
1				1							
3	1			2							
				3							
								1	1		
10	2			16			1	1	1		
81.96	16.39			175.83			10.98	14.70	14.70		
35				415				1			
.09				1.13							
.73				12.41							
3.50				25.93				1			
113	26			80	5	2	3	25	14		
926.22	213.11			846.15	54.95	21.97	33.98	367.64	205.88		
563				1,023				82			
1.54				.45				.22			
12.62				34.61				3.23			
4.98				15.18				3.28			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Despatch.				Constellation.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas					1			
Febricula					2			
Febris intermittens	19	1			7			
Febris remittens	3				1			
Parotitis					1	1		
Rötheln					2	1		
Vaccina					2			
Total.....	22	1			16	2		
Ratio per thousand.....	323.52	14.70			219.17	27.39		
Number of sick days	141				87			
Average number sick daily.....	.38				.94			
Av. number sick daily per thousand ..	5.58				12.87			
Average duration of treatment.....	6.40				5.43			
II.—CONSTITUTIONAL DISEASES.								
Adynamia								
Hypertrophia.....								
Rheumatismus acutus.....					1			
Rheumatismus chronicus.....	1							
Syphilis primitiva.....	1							
Syphilis consecutiva	1	1						
Total.....	3	1			1			
Ratio per thousand.....	44.11	14.70			13.69			
Number of sick days	86				3			
Average number sick daily.....	.23				.03			
Av. number sick daily per thousand ..	3.38				.41			
Average duration of treatment.....	25.66				3			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia					8			
Insolatio					1			
Insomnia								
Nausea marina					12			
Neuralgia	2				5			
Total.....	2				26			
Ratio per thousand.....	29.41				356.16			
Number of sick days	2				77			
Average number sick daily.....					.83			
Av. number sick daily per thousand ..					11.36			
Average duration of treatment.....	1				2.96			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Despatch.				Constellation.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Amaurosis	1				1	1		
Blepharitis	1				1			
Conjunctivitis	1				1	1		
Total	3				3	2		
Ratio per thousand	41.09				41.09	27.39		
Number of sick days	13				13			
Average number sick daily	.14				.14			
Av. number sick daily per thousand ..	1.91				1.91			
Average duration of treatment	4.33				4.33			
III.—DISEASES OF THE EAR.								
Otalgia								
Total								
Ratio per thousand								
Number of sick days								
Average number of sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment								
IV.—DISEASES OF THE TEETH.								
Odontalgia	1				1			
Total	1				1			
Ratio per thousand	13.69				13.69			
Number of sick days	2				2			
Average number sick daily	.02				.02			
Av. number sick daily per thousand ..	.27				.27			
Average duration of treatment	2				2			
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Palpitatio								
Total								
Ratio per thousand								
Number of sick days								
Average number of sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment								

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Despatch.				Constellation.			
	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
Diseases and injuries.								
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta								
Bronchitis chronica								
Catarrhus					1			
Pleuritis								
Total					1			
Ratio per thousand					13.69			
Number of sick days					3			
Average number sick daily					.03			
Av. number sick daily per thousand ..					.41			
Average duration of treatment					3			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus ..	1							
Colica					1			
Congestio hepatis								
Constipatio					11			
Diarrhœa acuta					27			
Diarrhœa chronica					1			
Dysenteria acuta	1							
Dyspepsia	1				1	1		
Enteritis					1	1		
Fistula in ano								
Hæmorrhoids					2			
Pharyngitis					2			
Tonsillitis	2	1			2			
Total	5	1			48	2		
Ratio per thousand	73.52	14.70			657.53	27.39		
Number of sick days	14				160			
Average number sick daily	.03				1.13			
Av. number sick daily per thousand ..	.44				15.47			
Average duration of treatment	2.8				3.33			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria	1	1						
Chancroides	1	1			1			
Cystitis								
Gonorrhœa	1	1			6	6		
Orchitis	1	1						
Total	4	4			7	6		
Ratio per thousand	58.82	58.82			95.89	82.19		
Number of sick days	6				96			
Average number sick daily	.01				1.04			
Av. number sick daily per thousand ..	.14				14.24			
Average duration of treatment	1.5				13.71			

dead, for each disease, on the North Atlantic Station—Continued.

Passaic.				Montauk.				Dale.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
4								1			
1				1							
1											
6				1				1			
101.67				23.25				24.39			
49				11				2			
.17				.03				.02			
2.88				.69				.48			
8.16				11				2			
2								1			
								1			
								1			
1								13			
1	1			1	1			1			
1	1										
								1			
2											
7	2			1	1			18			
118.65	33.89			23.25	23.25			439.02			
35				1				76			
.12								.81			
2.03								19.71			
5				1				4.22			
1											
1											
1	1										
1				1	1			1			
4	1			1	1			1			
67.79	16.94			23.25	23.35			24.39			
24				5				21			
.08				.01				.22			
1.31				.23				5.36			
6				5				21			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Despatch.				Constellation.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Clavus					1			
Synovitis					1			
Total					2			
Ratio per thousand					27.39			
Number of sick days					25			
Average number sick daily					.27			
Av. number sick daily per thousand					3.69			
Average duration of treatment					12.5			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus	3				1			
Eczema								
Furunculus	3				3			
Pernio								
Unguis involutis	1							
Ulcer								
Total	7				4			
Ratio per thousand	102.94				54.79			
Number of sick days	52				14			
Average number sick daily	.14				.15			
Av. number sick daily per thousand	2.05				2.05			
Average duration of treatment	7.42				3.5			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	1	1						
Total	1	1						
Ratio per thousand								
Number of sick days	2							
Average number sick daily								
Av. number sick daily per thousand								
Average duration of treatment	2							

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Despatch.				Constellation.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
C.—POISONS.								
Alcoholismus	1							
Delirium tremens	1	1						
Ebriositas								
Total	2	1						
Ratio per thousand	29.41	14.70						
Number of sick days	2							
Average number sick daily								
Av. number sick daily per thousand								
Average duration of treatment	1							
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio					1			
Ambustio								
Concussio cerebri					2			
Contusio	1				10			
Fractura					2			
Stemma	9	2			8	3		
Vulnus contusum	2				2			
Vulnus incisum	3				2			
Vulnus laceratum					1			
Vulnus punctum	1				2			
Total	16	2			30	3		
Ratio per thousand	235.29	29.41			410.95	41.09		
Number of sick days	118				237			
Average number sick daily	.32				2.57			
Av. number sick daily per thousand	4.70				35.19			
Average duration of treatment	7.37				7.9			
Grand total	62	11			142	15		
Ratio per thousand	911.76	161.76			1,945.20	205.47		
Number of sick days	423				117			
Average number sick daily	1.15				7.79			
Av. number sick daily per thousand	16.91				106.71			
Average duration of treatment	6.82				5.04			

dead, for each disease, on the North Atlantic Station—Continued.

Passaic.				Montauk.				Dale.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1											
2											
3											
50.84											
6											
.02											
.33											
2											
1											
1	1										
1				1				2			
2								1			
3				2				5			
								2			
								1			
8	1			3				10	1		
135.59	16.94			69.76				243.90	24.39		
32				20				105			
.11				.06				1.12			
1.86				1.39				27.31			
4				6.66				10.50			
78	19			23	7			54	2		
1,322.03	322.03			534.88	162.79			1,317.07	48.79		
363				103				279			
1.28				.30				3			
21.69				6.97				73.17			
4.65				4.47				5.16			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alarm.				Ajax.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Febricula								
Febris continua simplex								
Febris intermittens	8				5			
Febris remittens	1							
Varicella	1	1						
Total.....	10	1			5			
Ratio per thousand.....	250	25			138.88			
Number of sick days	28				17			
Average number sick daily	.10				.04			
Av. number sick daily per thousand ..	2.50				1.11			
Average duration of treatment.....	2.8				3.4			
II.—CONSTITUTIONAL DISEASES.								
Rheumatismus acutus								
Rheumatismus chronicus	1	1			3			
Rheumatismus gonorrhoeicus								
Syphilis primitiva.....	1	1						
Total.....	2	2			3			
Ratio per thousand.....	50	50			83.33			
Number of sick days	2				27			
Average number sick daily					.07			
Av. number sick daily per thousand...					1.94			
Average duration of treatment.....	1				9			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Convulsio	1	1						
Neuralgia	1	1						
Total.....	2	2						
Ratio per thousand.....	50	50						
Number of sick days	2							
Average duration of treatment.....	1							
II.—DISEASES OF THE EYE.								
Conjunctivitis.....	1							
Total.....	1							
Ratio per thousand.....	25							
Number of sick days	4							
Average number sick daily	.01							
Av. number sick daily per thousand ..	.25							
Average duration of treatment.....	4							

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alarm.				Ajax.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	1							
Bronchitis chronica	1	1						
Catarrhus								
Pneumonia	1	1						
Total	3	2						
Ratio per thousand	75	50						
Number of sick days	4							
Average number sick daily	.01							
Av. number sick daily per thousand...	.25							
Average duration of treatment	1.33							
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica					1			
Diarrhœa acuta	1							
Dysentery acuta								
Dysentery chronica	1	1						
Enteritis								
Hernia	1	1			1			
Tonsillitis	1	1			3			
Total	4	3			5			
Ratio per thousand	100	75			138.88			
Number of sick days	7				11			
Average number sick daily	.02				.03			
Av. number sick daily per thousand...	.50				.83			
Average duration of treatment	1.75				2.02			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Calculus					1	1		
Chancroides					1	1		
Gonorrhœa	2	1			1			
Hæmaturia	1	1						
Hydrocele	1	1						
Urethræ strictura					1	1		
Total	4	3			4	3		
Ratio per thousand	100	75			111.11	83.33		
Number of sick days	7				6			
Average number sick daily	.02				.01			
Av. number sick daily per thousand...	.50				.27			
Average duration of treatment	1.75				1.5			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alarm.				Ajax.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Periostitis.....								
Total								
Ratio per thousand.....								
Number of sick days ..								
Average number sick daily								
Av. number sick daily per thousand...								
Average duration of treatment.....								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....								
Furunculus								
Ulcer								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand...								
Average duration of treatment.....								
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	1	1			1	1		
Total	1	1			1	1		
Ratio per thousand.....	25	25			27.77	27.77		
Number of sick days	1				7			
Average number sick daily					.01			
Av. number sick daily per thousand...					.27			
Average duration of treatment.....	1				7			
C.—POISONS.								
Alcoholismus	1	1						
Colica pictonum.....								
Delirium tremens					2	1		
Total	1	1			2	1		
Ratio per thousand.....	25	25			55.55	27.77		
Number of sick days	1				4			
Average number sick daily.....					.01			
Av. number sick daily per thousand ..					.27			
Average duration of treatment.....	1				2			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alarm.				Ajax.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS.								
Ambustio								
Contusio	1							
Fractura					2			
Stemma								
Vulnus contusum					1			
Vulnus incisum								
Vulnus laceratum	1							
Total	2				3			
Ratio per thousand	50				83.33			
Number of sick days	10				62			
Average number sick daily	.03				.17			
Av. number sick daily per thousand ..	.75				4.72			
Average duration of treatment	5				20.66			
Grand total	30	15			23	5		
Ratio per thousand	750	375			638.88	138.88		
Number of sick days	66				134			
Average number sick daily	.24				.36			
Av. number sick daily per thousand ..	6				10			
Average duration of treatment	2.20				5.82			

dead, for each disease, on the North Atlantic Station—Continued.

Miantonomoh				Gedney.				Bache.				Nantucket.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1												1			
2	1							1	1			4	1		
3				2	1			1	1			1	1		
1				1											
								2				1			
7	1			3	1			4	2			7	2		
212. 12	30. 30			103. 44	34. 48			160	80			269. 23	76. 92		
68				52				11				33			
. 75				. 14				. 03				. 24			
2. 27				4. 82				1. 20				9. 23			
9. 71				17. 33				2. 75				4. 71			
13	4			16	5			20	5			22	9		
393. 93	121. 20			551. 72	172. 41			800	200			846. 15	346. 16		
91				202				91				69			
1. 01				. 55				. 24				. 50			
30 60				18. 96				9. 06				19. 23			
7				12. 62				4. 55				3. 13			

dead, for each disease, on the North Atlantic Station—Continued.

Catskill.				Lehigh.				Manhattan.				Mayflower.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
8			..	5	.....	.....	.....	7	1	.....	1	4	1	.....	.....
2		..	..	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10				6	.....	.....	.....	7	1	.....	1	4	1	.....	.....
666.66				428.57	.....	.....	.....	538.06	76.92	.....	76.92	363.63	90.90	.....	.....
36				21	.....	.....	.....	33	.....	.....	.....	33	.....	.....	.....
.09				.05	.....	.....	.....	.09	.....	.....	.....	.35	.....	.....	.....
6				3.57	.....	.....	.....	6.92	.....	.....	.....	31.81	.....	.....	.....
3.60				3.5	.....	.....	.....	4.71	.....	.....	.....	8.25	.....	.....	.....
.....												1	.....	.....	.....
.....				1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				3	2	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
.....				214.29	142.85	.....	.....	.....	.....	.....	.....	90.90	.....	.....	.....
.....				32	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
.....				.08	.....	.....	.....	.....	.....	.....	.....	.02	.....	.....	.....
.....				5.71	.....	.....	.....	.....	.....	.....	.....	1.81	.....	.....	.....
.....				10.66	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
.....															
.....				1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....
.....				71.43	.....	.....	.....	76.92	.....	.....	.....	90.90	.....	.....	.....
.....				2	.....	.....	.....	44	.....	.....	.....	1	.....	.....	.....
.....								.12	.....	.....	.....	.01	.....	.....	.....
.....								9.23	.....	.....	.....	.90	.....	.....	.....
.....				2	.....	.....	.....	44	.....	.....	.....	1	.....	.....	.....
.....												1	.....	.....	.....
.....												1	.....	.....	.....
.....												90.90	.....	.....	.....
.....												1	.....	.....	.....
.....												.01	.....	.....	.....
.....												.90	.....	.....	.....
.....												1	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Standish.				Mahopac.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
III.—DISEASES OF THE EAR.								
Otorrhœa								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	1				1			
Catarrhus								
Total	1				1			
Ratio per thousand	50				62.5			
Number of sick days	3				9			
Average number sick daily	.03				.02			
Av. number sick daily per thousand ..	1.50				1.25			
Average duration of treatment	3				9			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	2							
Colica								
Constipatio	1							
Diarrhœa acuta	5							
Dysentery acuta								
Gastritis	1							
Hæmorrhoids								
Hernia								
Total	9							
Ratio per thousand	4.50							
Number of sick days	16							
Average number sick daily	.17							
Av. number sick daily per thousand ..	8.50							
Average duration of treatment	1.77							

dead, for each disease, on the North Atlantic Station—Continued.

Catskill.				Lehigh.				Manhattan.				Mayflower.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....												1	.....	.....	.....
.....												1	.....	.....	.....
.....												90.90	.....	.....	.....
.....												2	.....	.....	.....
.....												.02	.....	.....	.....
.....												1.81	.....	.....	.....
.....												2	.....	.....	.....
.....															
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				71.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....															
.....															
.....				3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....															
.....								1	.....	.....	.....	1	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
1												2	.....	.....	.....
.....												1	.....	.....	.....
1				1	.....	.....	.....	1	.....	.....	.....	6	.....	.....	.....
66.66				71.43	.....	.....	.....	76.92	.....	.....	.....	545.45	.....	.....	.....
3				4	.....	.....	.....	1	.....	.....	.....	13	.....	.....	.....
.....				.01	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	.....
.....				.71	.....	.....	.....	.....	.....	.....	.....	12.72	.....	.....	.....
3				4	.....	.....	.....	1	.....	.....	.....	2.16	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Standish.				Mahopac.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO- URINARY SYSTEM.								
Chancroides					2	1		
Gonorrhœa					1			
Orchitis								
Total					3	1		
Ratio per thousand					187.5	62.5		
Number of sick days					30			
Average number sick daily					.08			
Av. number sick daily per thousand ..					5			
Average duration of treatment					10			
X.—DISEASES OF THE INTEGUMENT- ARY SYSTEM.								
Ulcer								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand ...								
Average duration of treatment								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Fibroma					1			
Sarcoma								
Total					1			
Ratio per thousand					62.5			
Number of sick days					3			
Average number sick daily								
Av. number sick daily per thousand ...								
Average duration of treatment					3			
C.—POISONS.								
Alcoholismus								
Delirium tremens								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Av. number sick daily per thousand ..								
Average duration of treatment								

TABLE III.—*Showing the number of cases, the invalided and*

Vessels or stations	Standish.				Mahopac.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS.								
Concussio cerebri	1							
Siremma	2	1						
Vulnus contusum								
Vulnus laceratum.....	1	1						
Total ..	4	2						
Ratio per thousand	200	100						
Number of sick days	19							
Average number sick daily	.05							
Av. number sick daily per thousand...	2.50							
Average duration of treatment	4.75							
Grand total	23	5			11	1		
Ratio per thousand	1,150	25			687.50	62.5		
Number of sick days	61				73			
Average number sick daily	.66				.20			
Av. number sick daily per thousand...	33				12.50			
Average duration of treatment.....	2.65				6.63			

dead, for each disease, on the North Atlantic Station—Continued.

Catskill.				Lehigh.				Manhattan.				Mayflower.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
												2			
												2			
												181.81			
												29			
												.31			
												28.18			
												14.5			
14	1			16	2			11	1		1	22	1		
933.33	66.66			1,142.85	142.85			846.15	76.92		76.92	2,000	90.90		
62				76				167				114			
.16				.20				.45				1.23			
10.66				14.28				34.61				111.81			
4.42				4.75				15.18				5.18			

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 2,279.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Catarrhus epidemicus.....	3	1.31	1	.43				
Erysipelas.....	2	.87						
Febricula.....	26	11.40	1	.43				
Febris continua simplex.....	18	7.89	3	1.31				
Febris enterica.....	4	1.75	2	.87			1	.43
Febris intermittens.....	172	75.47	15	6.58				
Febris remittens.....	27	11.84	4	1.75				
Morbilli.....	3	1.31	3	1.31				
Parotitis.....	2	.87	2	.87				
Roseola.....								
Rötheln.....	2	.87	1	.43				
Scarlatina.....	5	2.19	5	2.19				
Vaccina.....	53	23.25						
Varicella.....	1	.43	1	.43				
Variola.....								
Varioloides.....	1	.43	1	.43				
Total.....	319	139.97	39	17.01			1	.43
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	6	2.63						
Anæmia.....	3	1.31	1	.43				
Carcinoma.....								
Hypertrophia.....	1	.43	1	.43				
Lumbago.....	8	3.51						
Podagra.....								
Rheumatismus acutus.....	47	20.62	12	5.26				
Rheumatismus chronicus.....	22	9.65	10	4.38	1	.43		
Rheumatismus gonorrhœica.....	1	.43						
Scrofula.....	1	.43						
Syphilis primitiva.....	34	14.91	13	5.65				
Syphilis consecutiva.....	28	12.38	9	3.94				
Torticollis.....	1	.43						
Total.....	152	66.69	46	20.18	1	.43		
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia.....								
Cephalalgia.....	32	15.04						
Cerebritis.....	1	.43	1	.43				
Chorea.....	2	.87	2	.87				
Convulsio.....	1	.43						
Dementia.....	3	1.31	2	.87	1	.43		
Epilepsia.....	8	3.51	3	1.31	2	.87		
Hysteria.....	2	.87	2	.87				
Insolatio.....	2	.87						
Insomnia.....								
Mania.....	2	.87						
Melancholia.....								
Meningitis.....	2	.87	1	.43			1	.43
Nausea marina.....	57	25.01						
Neuralgia.....	26	11.40	1	.43				
Neuritis.....								
Paralysis.....								
Pleurodynia.....	2	.87	1	.43				
Sciatica.....								
Vertigo.....	1	.43						
Total.....	141	61.43	13	5.65	3	1.31	1	.43

dead, in decennial periods, with the ratios per thousand.

BETWEEN 25 AND 35 YEARS. (Mean force, 1,406.)								BETWEEN 35 AND 45 YEARS. (Mean force, 679.)							
Cases.		Invalided.				Died.		* Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	.71	1	.71					1	1.47	1	1.47				
8	5.68							5	7.36	1	1.47				
5	3.55	1	.71					3	4.41	2	2.94				
2	1.42	2	1.42					1	1.47						
133	94.59	11	7.82			1	.71	45	66.27	8	11.78				
25	17.78	3	2.13	1	.71			6	8.83	1	1.47				
3	2.13														
17	12.09	1	.71												
1	.71	1	.71												
4	2.84	4	2.84												
199	141.53	24	17.07	1	.71	1	.71	61	89.82	13	19.14				
14	9.95	8	5.68					10	14.72	8	11.78				
								1	1.47	1	1.47				
								1	1.47	1	1.47				
15	10.66	4	2.84					10	14.72						
1	.71							1	1.47						
35	24.89	8	5.68					32	47.12	7	10.30				
28	19.91	10	7.11					18	26.50	3	4.41				
33	23.47	14	9.95					8	11.78	3	4.41				
30	21.34	11	7.82					9	13.25	2	2.94				
156	110.95	55	39.11					90	132.54	25	36.81				
6	4.26	1	.71					1	1.47						
								8	11.78						
1	.71							1	1.47	1	1.47				
1	.71	1	.71					1	1.47	1	1.47				
5	3.55	2	1.42	1	.71										
4	2.84														
1	.71	1	.71					2	2.94						
2	1.42	2	1.42					1	1.47	1	1.47				
3	2.13	1	.71												
1	.71	1	.71												
2	1.42														
26	18.50	2	1.42					15	22.09	3	4.41				
1	.71														
1	.71	1	.71												
4	2.84							1	1.47						
4	2.84							1	1.47						
62	44.09	12	8.53	1	.71			31	45.65	6	8.83				

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 263.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Catarrhus epidemicus.....								
Erysipelas.....								
Febricula.....								
Febris-cerebro-spinalis.....	1	3.80					1	3.80
Febris continua simplex.....	1	3.80						
Febris enterica.....	1	3.80						
Febris intermittens.....	23	87.45	3	11.40			1	3.80
Febris remittens.....								
Morbilli.....								
Parotitis.....								
Roseola.....								
Rötheln.....								
Scarlatina.....								
Vaccina.....								
Varicella.....								
Variola.....								
Varioloides.....								
Total.....	26	98.84	3	11.40			2	7.60
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	9	34.22						
Anæmia.....	1	3.80						
Carcinoma.....								
Hypertrophia.....								
Lumbago.....	3	11.40						
Podagra.....	2	7.60	1	3.80				
Rheumatismus acutus.....	19	72.24	2	7.60				
Rheumatismus chronicus.....	14	53.23	3	11.40				
Rheumatismus gonorrhœica.....								
Scrofula.....								
Senectus.....	1	3.80						
Syphilis primitiva.....	1	3.80						
Syphilis consecutiva.....	2	7.60	1	3.80				
Torticollis.....								
Total.....	52	197.71	7	26.61				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia.....	1	3.80						
Cephalalgia.....								
Cerebritis.....								
Chorea.....								
Convulsio.....	1	3.80	1	3.80				
Dementia.....								
Epilepsia.....								
Hysteria.....								
Insolatio.....								
Insomnia.....								
Mania.....								
Melancholia.....	1	3.80	1	3.80				
Meningitis.....								
Nausea marina.....								
Neuralgia.....	5	19.01	1	3.80				
Neuritis.....								
Paralysis.....								
Pleurodynia.....								
Sciatica.....	1	3.80						
Vertigo.....	1	3.80						
Total.....	10	38.02	3	11.40				

dead, in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 87.)								TOTALS. (Mean force, 4,714.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	11.49	1	11.49					3	.63	1	.21				
1	11.49							5	1.06	3	.63				
								40	8.48	2	.42				
								1	.21					1	.21
								27	5.72	6	1.27				
								8	1.69	4	.84			1	.21
16	183.90							389	82.52	37	7.84			2	.42
								58	12.30	8	1.69	1	.21		
								3	.63	3	.63				
								2	.42	2	.42				
								3	.63						
								2	.42	1	.21				
								5	1.06	5	1.06				
								70	14.84	1	.21				
								1	.21	1	.21				
								1	.21	1	.21				
								5	1.06	5	1.06				
18	206.89	1	11.49					623	132.15	80	16.97	1	.21	4	.84
4	45.97	3	34.48					43	9.10	19	4.03				
								5	1.06	2	.42				
								1	.21	1	.21				
								1	.21	1	.21				
2	22.98	1	11.49					38	8.06	5	1.06				
3	34.48							4	.84	1	.21				
15	172.41	3	34.48					136	28.85	29	6.15				
								97	20.57	29	6.15	1	.21		
								1	.21						
								1	.21						
1	11.49	1	11.49					2	.42	1	.21				
								76	16.12	30	6.36				
								69	14.63	23	4.87				
								1	.21						
25	287.35	8	91.95					475	100.76	141	29.91	1	.21		
1	11.49	1	11.49					2	.42						
								47	9.96	2	.42				
								1	.21	1	.21				
								2	.42	2	.42				
								4	.84	2	.42				
								5	1.06	4	.84	1	.21		
								13	2.75	5	1.06	3	.63		
								6	1.27	2	.42				
1	11.49							5	1.06						
1	11.49							3	.63	2	.42				
								4	.84	2	.42				
								4	.84	2	.42				
								3	.63	2	.42			1	.21
3	34.48	1	11.49					59	12.51						
								75	15.91	8	1.69				
								1	.21						
								1	.21	1	.21				
								7	1.48	1	.21				
								1	.21						
3	34.48							10	2.12						
9	103.44	2	22.98					253	53.66	36	7.63	4	.84	1	.21

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 2,279.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Amaurosis								
Asthenopia	1	.43	1	.43				
Blepharitis	1	.43						
Conjunctivitis	20	8.77	1	.43				
Hordeolum								
Iritis	3	1.31	1	.43				
Keratitis								
Ophthalmia	1	.43	1	.43				
Retinitis	1	.43						
Scleritis								
Ulcer cornæ	3	1.31	1	.43				
Total	30	13.26	5	2.19				
III.—DISEASES OF THE EAR.								
Otalgia	5	2.19	1	.43				
Otitis	7	3.07	2	.87				
Otorrhœa	8	3.51						
Surditas	1	.43	1	.43				
Total	21	9.21	4	1.75				
IV.—DISEASES OF THE TEETH.								
Odontalgia	7	3.07						
Parulis								
Total	7	3.07						
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma								
Angina pectoris								
Morbi valvularum cordis	3	1.31	2	.87	1	.43		
Palpitatio	4	1.75	1	.43				
Phlebitis	1	.43						
Syncope	1	.43						
Varix								
Total	9	3.94	3	1.31	1	.43		
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	1	.43						
Bronchitis acuta	96	42.12	18	7.89				
Bronchitis chronica	14	6.09	5	2.19				
Catarrhus	58	25.45			1	.43		
Epistaxis	2	.87	1	.43				
Hæmoptysis	1	.43						
Laryngitis	10	4.38	1	.43				
Phthisis pneumonica acuta	1	.43	1	.43				
Phthisis pneumonica chronica	5	2.19	4	1.75				
Pleuritis	6	2.63	2	.87				
Pneumonia	8	3.51	3	1.31				
Total	202	88.63	35	15.35	1	.43		
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	8	3.51						
Colica	28	12.28	1	.43				
Congestio hepatis	3	1.31	1	.43				
Constipatio	16	6.97						
Diarrhœa acuta	100	43.87	7	3.07				
Diarrhœa chronica	6	2.63	2	.87				
Dysenteria acuta	5	2.19	1	.43				

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 263.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE.								
Amaurosis								
Asthenopia								
Blepharitis								
Conjunctivitis								
Hordeolum								
Iritis								
Keratitis								
Ophthalmia								
Retinitis								
Sclerotitis								
Ulcus cornæ								
Total								
III.—DISEASES OF THE EAR.								
Otalgia								
Otitis	1	3.80						
Otorrhœa	1	3.80						
Surditas								
Total	2	7.60						
IV.—DISEASES OF THE TEETH.								
Odontalgia								
Parulis								
Total								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma	1	3.80	1	3.80				
Angina pectoris								
Dilatatio cordis	1	3.80						
Hypertrophica cordis								
Morbi valvularum cordis								
Palpitatio								
Phlebitis								
Syncope								
Varix								
Total	2	7.60	1	3.80				
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma								
Bronchitis acuta	9	34.22						
Bronchitis chronica	6	22.81	3	11.40				
Catarrhus	14	53.23	1	38.0				
Epistaxis								
Hæmoptysis								
Laryngitis								
Phthisis pneumonica acuta								
Phthisis pneumonica chronica								
Pleuritis								
Pneumonia	2	7.60	2	7.60				
Total	31	117.87	6	22.81				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica	8	30.41						
Congestio hepatis								
Constipatio	9	34.22	4	15.20				
Diarrhœa acuta	10	38.02						

dead, in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 87.)								TOTALS. (Mean force, 4,714.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
2	22.98	1	11.49					3	.63	1	.21				
								2	.42	2	.42				
								1	.21						
1	11.49	1	11.49					40	8.48	4	.84				
								3	.63						
								8	1.69	2	.42				
								1	.21						
								2	.42	1	.21				
								4	.84	2	.42				
								1	.21						
								7	1.48	4	.84				
3	34.48	2	22.98					72	15.91	16	3.39				
								6	1.27	1	.21				
								11	2.33	2	.42				
								14	2.96	1	.21				
								2	.42	1	.21				
								33	6.99	5	1.06				
								7	1.48						
								1	.21						
								8	1.69						
								3	.63	2	.42			1	.21
								1	.21	1	.21				
								1	.21						
1	11.49	1	11.49					1	.21	1	.21				
1	11.49	1	11.49					7	1.48	4	.84	1	.21	1	.21
								16	3.39	4	.84				
								1	.21						
								1	.21						
								1	.21						
2	22.98	2	22.98					32	6.78	12	2.54	1	.21	2	.42
								8	1.69	2	.42				
1	11.49							168	35.63	21	4.45				
2	22.98	2	22.98					36	7.63	17	3.60				
5	57.47							140	29.91	2	.42	1	.21		
								2	.42	1	.21				
								5	1.06	2	.42				
								16	3.39	1	.21				
								3	.63	2	.42				
								17	3.60	15	3.18			1	.21
								9	1.90	5	1.06				
1	11.49	1	11.49					18	3.81	9	1.90			1	.21
9	103.44	8	34.48					422	89.52	77	16.33	1	.21	2	.42
								23	4.87						
								58	12.30	1	.21				
								6	1.27	1	.21				
								28	5.94	4	.84				
8	91.95							191	40.51	11	2.33				

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 2,279.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.								
Dysentery chronica.....	1	.43						
Dyspepsia.....	9	3.94	3	1.31				
Enteritis.....	3	1.31	2	.87				
Fistula in ano.....	1	.43	1	.43				
Gastritis.....	2	.87						
Gastrodynia.....								
Hæmatemesis.....								
Hæmorrhoids.....	11	5.26	1	.43				
Hepatitis acuta.....	2	.87	1	.43				
Hernia.....	9	3.94	5	2.19	1	.43		
Icterus.....	2	.87	2	.87				
Peritonitis.....								
Pharyngitis.....	30	13.26						
Prolapsus ani.....								
Tonsillitis.....	103	45.19	7					
Vermes.....	3	1.31	2	.87				
Total.....	342	150.06	36	15.79	1	.43		
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria.....								
Balanitis.....	4	1.75						
Chancroides.....	22	9.64	5	2.19				
Cystitis.....	6	2.63	2	.87				
Dysuria.....	1	.43	1	.43				
Enuresis.....	15	6.53	3	1.31	1	.43		
Epididymitis.....								
Gonorrhœa.....	60	26.32	10	4.38	1	.43		
Hæmaturia.....	1	.43	1	.43				
Hydrocele.....	1	.43	1	.43				
Nephritis.....	2	.87	1	.43				
Orchitis.....	28	12.28	7	3.07				
Paraphymosis.....	1	.43						
Phymosis.....	4	1.75	1	.43				
Prostatitis.....								
Urethræ strictura.....	3	1.31	2	.87				
Varicocele.....	2	.87						
Total.....	150	65.81	34	14.91	2	.87		
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....	1	.43						
Clavus.....	1	.43						
Ostitis.....								
Periostitis.....								
Synovitis.....	10	4.38	4	1.75	1	.43		
Total.....	12	5.26	4	1.75	1	.43		
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	73	32.03	3	1.31				
Acne.....	1	.43						
Anthrax.....	1	.43	1	.43				
Cellulitis.....	2	.87						
Eczema.....	2	.87						
Erythema.....	2	.87						
Furunculus.....	84	36.85						
Herpes.....	2	.87						
Impetigo.....	2	.87						
Intertoigo.....	1	.43						
Lichen.....	1	.43						
Onychia.....	6	2.63	1	.43				
Paronychia.....	35	15.35	1	.43				

dead, in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 1,406.)								BETWEEN 35 AND 45 YEARS. (Mean force, 679.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	.71	1	.71					1	1.47	1	1.47				
9	6.40	3	2.13					4	5.89	1	1.47				
1	.71	1	.71					1	1.47						
2	1.42	2	1.42					1	1.47	1	1.47				
								1	1.47						
1	.71														
1	.71														
12	8.53	3	2.13					6	8.83	1	1.47				
1	.71														
9	6.40	5	3.55					2	2.94						
								1	1.47						
1	.71	1	.71												
13	9.24							2	2.94						
1	.71	1	.71					2	2.94	1	1.47				
32	22.76	3	2.13					5	7.36						
1	.71							1	1.47						
179	127.31	24	17.07					59	86.88	8	11.78				
1	.71	1	.71					1	1.47	1	1.47				
1	.71														
21	14.93	2	1.42	1	.71			9	13.25	1	1.47				
2	1.42														
1	.71														
21	14.93	4	2.84					9	13.25						
2	1.42	1	.71					1	1.47	1	1.47				
2	1.42	1	.71												
18	12.80	4	2.84					4	5.89	1	1.47				
1	.71							1	1.47	1	1.47				
								1	1.47	1	1.47				
5	3.55	2	1.42					1	1.47						
3	2.13														
78	55.47	15	10.66	1	.71			27	39.76	6	8.83				
								2	2.94	1	1.47				
								1	1.47						
5	3.55	1	.71												
5	3.55	1	.71					3	4.41	1	1.47				
39	27.69	6	4.26					8	11.78						
								1	1.47						
1	.71														
3	2.13	1	.71												
9	6.40	1	.71					2	2.94						
42	29.87							15	22.09						
1	.71														
1	.71							2	2.94						
12	8.53							4	5.89						

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 263.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.								
Diarrhœa chronica								
Dysentery acuta	1	3.80						
Dysentery chronica								
Dyspepsia	2	7.60	1	3.80				
Enteritis								
Fistula in ano								
Gastritis								
Gastrodynia	2	7.60						
Hæmatemesis	1	3.80						
Hæmorrhoids	3	11.40						
Hepatitis acuta								
Hernia	4	15.20	2	7.60				
Icterus								
Peritonitis								
Pharyngitis	2	7.60						
Prolapsus ani								
Tonsillitis	1	3.80						
Vermes								
Total	43	163.49	7	26.61				
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria								
Balanitis								
Calculus								
Chancroides								
Cystitis								
Dysuria								
Enuresis								
Epididymitis								
Gonorrhœa	1	3.80						
Hæmaturia								
Hydrocele								
Nephritis	1	3.80					1	3.80
Orchitis								
Paraphymosis								
Phymosis								
Prostatitis								
Urethræ strictura	1	3.80	1	3.80				
Varicocele								
Total	3	11.40	1	3.80			1	3.80
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis								
Clavus								
Ostitis								
Periostitis								
Synovitis	1	3.80						
Total	1	3.80						
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abcessus	4	15.20	1	3.80				
Acne								
Anthrax	1	3.80						
Cellulitis								
Eczema	2	7.60	1	3.80				
Erythema								
Furunculus	3	11.40						
Herpes	1	3.80						
Impetigo	1	3.80	1	3.80				
Intertrigo								

dead, in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 87.)								TOTALS. (Mean force, 4,714.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	11.49							9	1.90	3	.63				
2	22.98	1	11.49					14	2.96	3	.63				
								5	1.06	3	.63				
								24	5.08	8	1.69				
								5	1.06	3	.63				
								4	.84	4	.84				
1	11.49							4	.84						
								3	.63						
								2	.42						
								32	6.78	5	1.06				
								3	.63	1	.21				
								24	5.08	12	2.54	1	.21		
								3	.63	2	.42				
								1	.21	1	.21				
								47	9.96						
								3	.63	2	.42				
								141	29.91	10	2.12				
								5	1.06	2	.42				
12	137.93	1	11.49					635	134.70	76	16.12	1	.21		
1	11.49	1	11.49					3	.63	3	.63				
1	11.49	1	11.49					5	1.06						
1	11.49							1	.21	1	.21				
								52	11.04	8	1.69	1	.21		
								9	1.90	2	.42				
								1	.21	1	.21				
								15	3.18	3	.63	1	.21		
								1	.21						
								91	19.30	14	2.96	1	.21		
								1	.21	1	.21				
1	11.49							5	1.06	3	.63				
1	11.49	1	11.49					6	1.27	3	.63			1	.21
1	11.49	1	11.49					51	10.83	13	2.75				
								1	.21						
								5	1.06	1	.21				
								1	.21	1	.21				
								10	2.12	6	1.27				
								6	1.27						
6	68.96	4	45.97					264	56.00	60	12.72	3	.63	1	.21
								1	.21						
								1	.21						
								2	.42	1	.21				
								1	.21						
1	11.49	1	11.49					17		6	1.27	1	.21		
1	11.49	1	11.49					22	4.61	7	1.48	1	.21		
1	11.49							125	26.51	10	2.12				
								1	.21						
								4	.84	1	.21				
								5	1.06	1	.21				
1	11.49	1	11.49					16	3.39	3	.63				
1	11.49							3	.63						
4	45.97							148	31.39						
								3	.63						
								3	.63	1	.21				
								1	.21						

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 2,279.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM—Continued.								
Pemphigus.....	1	.43						
Pernio	6	2.63						
Prurigo	1	.43	1	.43				
Psoriasis	3	1.31	1	.43				
Scabies.....	13	5.65	13	5.65				
Tinea.....								
Unguis involutis.....	4	1.75						
Ulcus	44	19.30	4	1.75	1	.43		
Urticaria.....	2	.87						
Total.....	286	125.49	25	10.96	1	.43		
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	30	13.26	8	3.51				
Lymphangitis.....	1	.43						
Total.....	31	13.70	8	3.51				
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Adenoma.....								
Cystis	2	.87						
Fibroma.....	2	.87	1	.43				
Polypus.....	1	.43	1	.43				
Sarcoma.....	1	.43						
Total.....	6	2.63	2	.87				
C.—POISONS.								
Alcoholismus.....	4	1.75	1	.43				
Colica pictorum.....	1	.43						
Delirium tremens.....	4	1.75	3	1.31				
Ebriositas	1	.43						
Vulnus venenatum.....	2	.87						
Total.....	12	5.26	4	1.75				
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	15	6.53						
Ambustio	22	9.64	2	.87				
Concussio cerebri.....	2	.87	1	.43				
Concussio spinalis.....	1	.43						
Congelatio	7	3.07	1	.43				
Contusio	79	34.66	4	1.75				
Fractura	15	6.53	7	3.07				
Luxatio	7	3.07	2	.87	1	.43		
Stemma.....	68	29.83	8	3.51				
Submersio	1	.43					1	.43
Vulnus contusum.....	59	25.89	2	.87	1	.43		
Vulnus incisum	35	15.35	1	.43				
Vulnus laceratum.....	29	12.83	2	.87				
Vulnus punctum.....	14	6.09						
Vulnus sclopetarium.....	3	1.31	2	.87				
Total.....	357	156.64	32	15.04	2	.87	1	.43
Grand total.....	2,077	911.36	290	127.24	13	5.65	3	1.31

dead, in decennial periods, with the ratios per thousand—Continued.

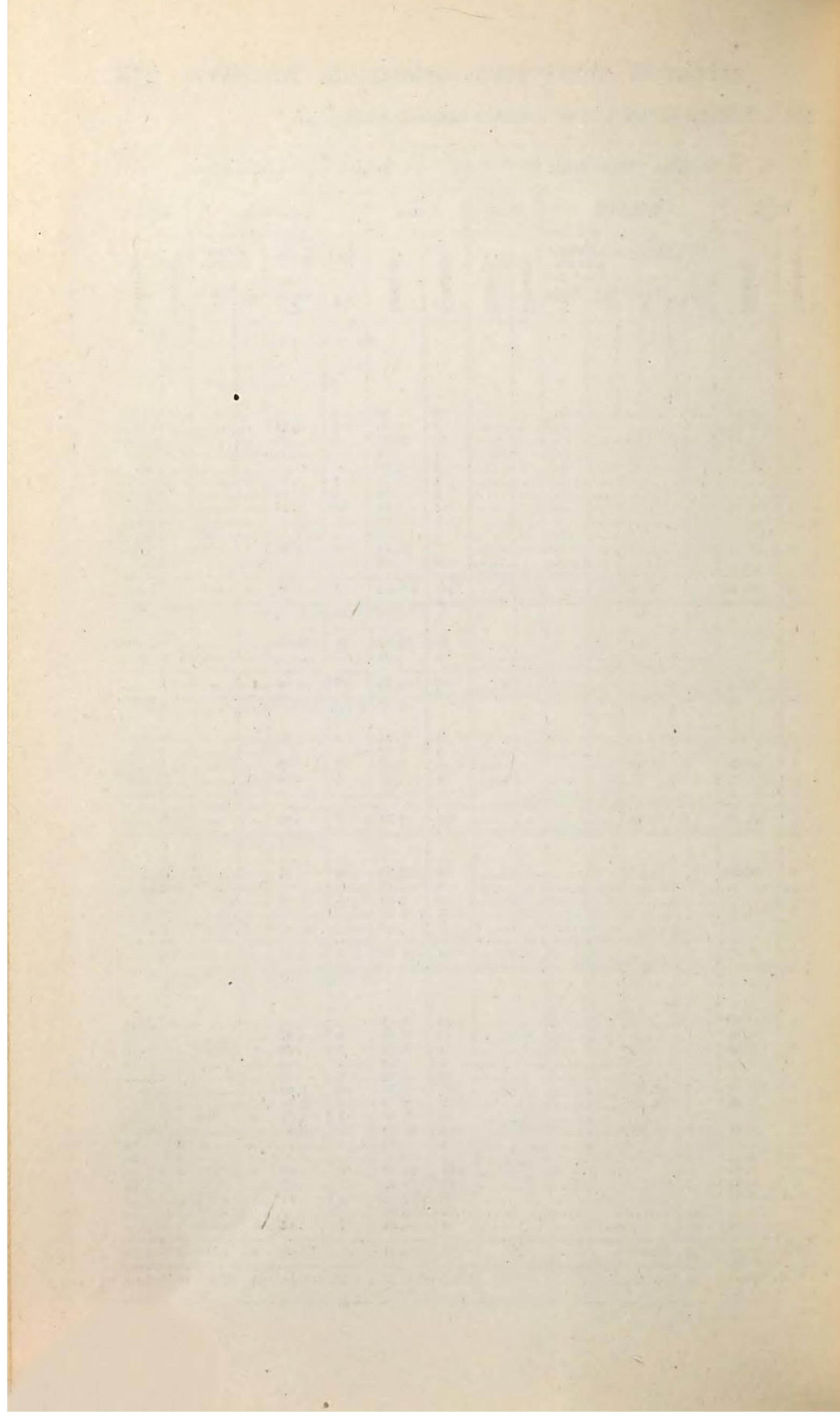
BETWEEN 25 AND 35 YEARS. (Mean force, 1,406.)								BETWEEN 35 AND 45 YEARS. (Mean force, 679.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	.71							2	2.94						
								1	1.47						
								1	1.47						
18	12.80	3	2.13					13	19.14	1	1.47				
1	.71														
128	91.04	11	7.82					49	72.17	1	1.47				
27	19.20	9	6.40					2	2.94						
27	19.20	9	6.40					2	2.94						
1	.71							1	1.47	1	1.47				
2	1.42					1	.71	1	1.47						
3	2.13					1	.71	2	2.94	1	1.47				
16	9.95	1	.71					21	30.92	2	2.94				
1	.71							2	2.94	1	1.47				
3	2.13	1	.71					2	2.94						
2	1.42														
22	15.64	2	1.42					25	36.81	3	4.41				
3	2.13							7	10.30						
15	10.66	1	.71					2	2.94						
3	2.13	1	.71					4	5.89	1	1.47			2	2.94
2	1.42							1	1.47	1	1.47				
56	39.83	1	.71					32	47.12	1	1.47				
10	7.11	4	2.84					3	4.41						
4	2.84							1	1.47						
40	28.44	5	3.55					30	44.18	3	4.41				
3	2.13					3	2.13								
24	17.07							8	11.78	1					
19	13.51	1	.71					5	7.36	1.47				1	1.47
17	12.09	2	1.42					9	13.25						
6	4.26							3	4.41						
								1	1.47						
202	143.66	15	10.66			3	2.13	106	156.11	7	10.30			3	4.41
1,225	871.26	201	142.95	3	2.13	7	4.97	540	795.28	87	128.13			5	7.36

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 263.)							
	Cases.		Invalided.		Died.			
	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM—Continued.								
Lichen.....								
Onychia.....								
Paronychia.....								
Pemphigus.....								
Pernio.....								
Prurigo.....								
Psoriasis.....								
Scabies.....								
Tinea.....								
Unguis involutis.....	1	3.80						
Ulcus.....								
Urticaria.....								
Total.....	13	49.43	3	11.40				
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....								
Lymphangitis.....								
Total.....								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Adenoma.....								
Cystis.....								
Fibroma.....								
Polypus.....								
Sarcoma.....								
Total.....								
C.—POISONS.								
Alcoholismus.....	12	35.63						
Colica pictonum.....								
Delirium tremens.....	1	3.80						
Ebriositas.....	1	3.80						
Vulnus venenatum.....								
Total.....	14	53.23						
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....								
Ambustio.....	4	15.20						
Concussio cerebri.....	3	11.40						
Concussio spinalis.....								
Congelatio.....								
Contusio.....	18	68.44						
Fractura.....	3	11.40	1	3.80				
Luxatio.....	2	7.60	1	3.80				
Stremma.....	12	35.63						
Submersio.....								
Suicidium.....	1	3.80					1	3.80
Vulnus contusum.....	2	7.60						
Vulnus incisum.....	1	3.80						
Vulnus laceratum.....	1	3.80						
Vulnus punctum.....								
Vulnus sclopetarium.....								
Total.....	47	178.69	2	7.60			1	3.80
Grand total.....	244	927.75	33	125.48			4	15.20

dead, in decennial periods, with the ratios per thousand—Continued.

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SANITARY CONDITION
OF THE
SOUTH ATLANTIC STATION.

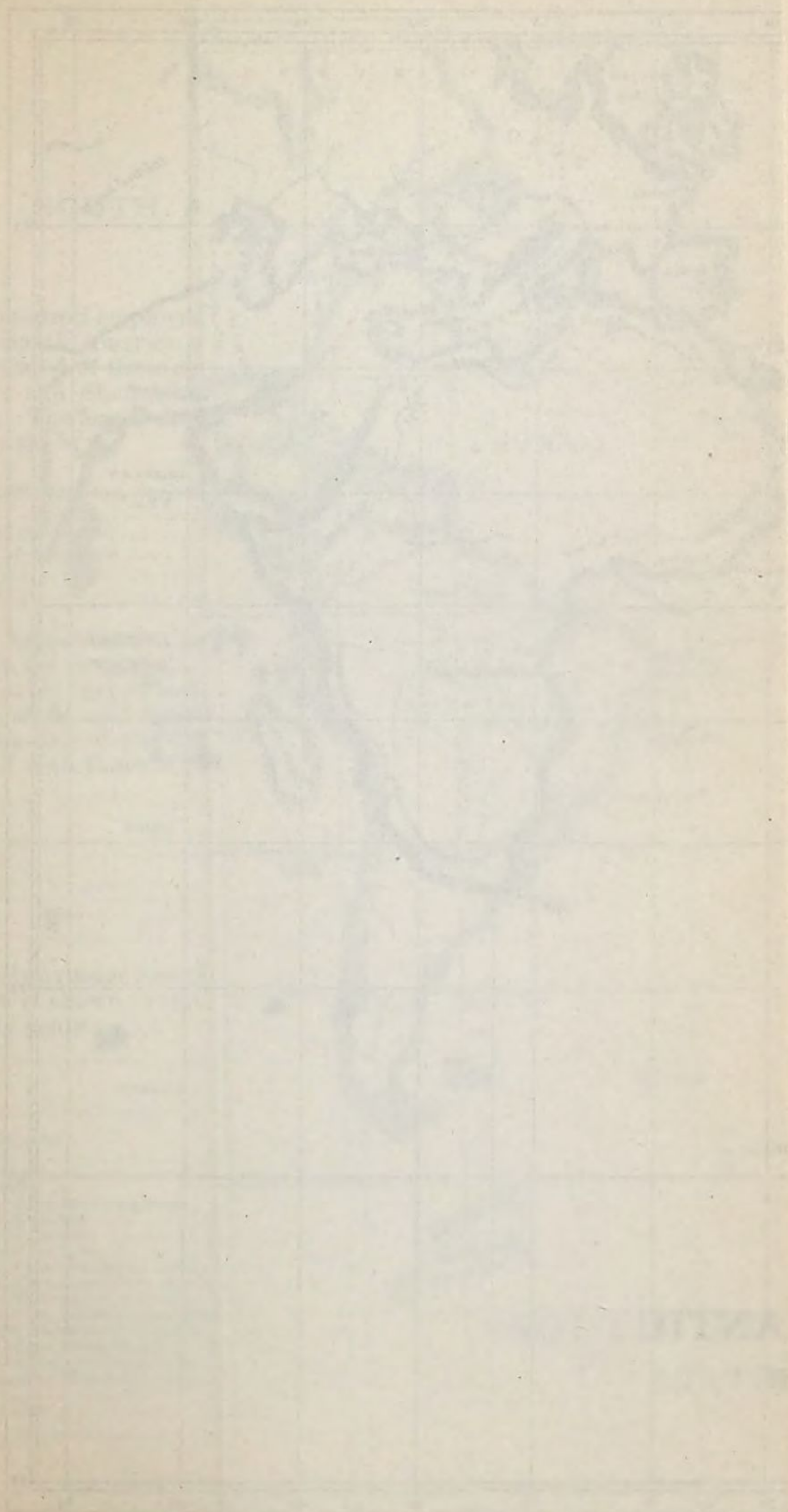
ROYAL CANADIAN MOUNTED POLICE

1914

ROYAL CANADIAN MOUNTED POLICE

1914

1914



SOUTH ATLANTIC SQUADRON.

The squadron employed upon this station (which comprises the east coast of South America and the west coast of Africa) during the year 1882 consisted of three ships, viz: Brooklyn flag-ship; 2d rate, Marion, 3rd rate; and Shenandoah, 2d rate, the latter serving only about half the year. The force, corrected for time, was 611, or 196 greater than that of last year.

The number admitted, including those remaining from last year, was.....	682 = 1,124.38 $\frac{0}{0}$
Discharged recovered.....	632 = 1,034.37 $\frac{0}{0}$
Invalided to hospitals.....	46 = 75.28 $\frac{0}{0}$
Died.....	4 = 6.54 $\frac{0}{0}$
Continued.....	5

These figures show a small increase, 81.64 $\frac{0}{0}$ in the ratio of sick as well as in the invalided. The loss of service amounted to 6,806 days, nearly double that of last year. The daily average number of sick was, absolute, 18.64, and relative, 30.50 $\frac{0}{0}$.

The sick rate of the different ships is shown in the following table, compared with those of the three preceding years:

Ships.	1879.	1880.	1881.	1882.
Brooklyn.....				25.04
Marion.....		18.27	21.58	36.95
Shenandoah.....	34.91	11.24	27.32	99.10

The daily average loss of service per thousand from the various classes of disease is shown in the following table, as compared with the three preceding years:

Diseases.	1879.	1880.	1881.	1882.
GENERAL DISEASES:				
Zymotic.....	2.42	2.63	.88	2.52
Constitutional.....	5.14	8.43	3.52	3.38
LOCAL DISEASES:				
Diseases of the nervous system.....	.57	2.04	.55	3.38
Diseases of the eye.....	.64	1.39	.28	.22
Diseases of the ear.....	.54	.07	.14	
Diseases of the teeth.....	.05	.05	.02	
Diseases of the circulatory system.....	.04	.01	.02	.36
Diseases of the respiratory system.....	2.57	7.19	3.79	4.46
Diseases of the digestive system.....	1.46	3.66	2.28	2.38
Diseases of the genito-urinary system.....	2.01	4.81	.86	1.80
Diseases of the locomotive system.....	.78	.01	.07	.81
Diseases of the integumentary system.....	2.14	2.63	4.98	2.63
Diseases of the absorbent system.....	.96	1.10	1.03	1.37
Non-malignant tumors and cysts.....				
POISONS.....	.19	.23	.43	.18
VIOLENT DISEASES.....	3.36	9.21	5.56	6.41

The causes of invaliding and the distribution are shown in the comparative ratios of the following table with those of preceding years :

Diseases.	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic.....			11.45
Constitutional	5.63	2.40	9.82
LOCAL DISEASES:			
Diseases of the nervous system	9.39	7.24	11.45
Diseases of the circulatory system	1.87		1.63
Diseases of the respiratory system.....	18.79	7.24	13.08
Diseases of the digestive system.....	3.75		9.82
Diseases of the genito-urinary system.....	1.87	2.40	6.54
Diseases of the locomotive system			1.63
Diseases of the integumentary system.....		2.40	1.63
VIOLENT DISEASES		4.81	6.54

The invaliding occurred on the several ships as follows:

Brooklyn	18 = 53.73%
Marion	17 = 90.90%
Shanandoah	11 = 123.59%

GENERAL DISEASES.

ZYMOTIC GROUP.

The aggregate of cases coming within this class of diseases reached 85, a ratio of 139.11%, being an increase over that of last year, which was 77.1%. The number of sick daily was 2.52%, and the loss of service was 565 days; the average duration of treatment was 6.64 days. There were 7 invalided, a ratio of 11.45%. Happily there was no yellow fever during the year.

The following table shows the ratios of these diseases on the various ships as well as for the preceding years:

Ships.	1879.	1880.	1881.	1882.
Marion		75.18	76.50	187.16
Brooklyn				131.34
Shenandoah	16.39	50.75	77.58	67.41

Erysipelas.—There were reported 4 cases of this affection, giving a ratio of 6.54%, and a loss of 20 days. All the cases occurred on the Brooklyn, and were discharged only after an average duration of 5 days.

Febricula.—There were 18 cases of this disease returned, the ratio being 29.45%. The number sick daily was .52%, and the loss of service 117 days. The Brooklyn reported 16 cases and the Marion 2. All returned to duty after an average period of treatment of 6.5 days.

Febris continua simplex.—Ten cases of this disease appear on the returns, the ratio being 16.36%, and the loss of time 122 days. The daily ratio of sick was .54% and the average duration of treatment 12.20 days. All recovered on board. The distribution of the disease was 5 on the Brooklyn, 3 on the Marion, and two on the Shenandoah.

Febris enterica.—A single case of typhoid fever was reported from the Marion, the ratio being 1.63%, and it was restored to duty after 41 days of treatment.

Febris intermittens.—There were 32 entries for this disease upon the records, a ratio of 52.37% as against 40.96% returned last year; the

loss of service was 157 days, and the average duration of treatment 4.90 days. The number sick daily from this disease was $.70\frac{0}{100}$. All the cases but 1 recovered, the latter being invalided to hospital from the Brooklyn.

Febris remittens.—One case of remittent fever was reported from the Marion, and recovered after 13 days of treatment.

Vaccina.—There were 13 cases of sickness from this cause, the ratio being $21.27\frac{0}{100}$, and the loss of service 81 days. The number sick daily was $36\frac{0}{100}$, and the average duration of treatment was 6.23 days. All the cases occurred on the Marion and returned to duty.

The following table of vaccinations is presented:

Vessels.	No evidence of previous vaccination.		Presenting good cicatrices.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Brooklyn.....	4	155	0	1	0	0	160
Marion.....	124	59	3	0	4	4	194
Shenandoah.....	0	3	0	0	0	0	3
Total.....	128	217	3	1	4	4	357
Per cent. of all cases.....	96.8		1.1		2.2		.....
Per cent. successful.....	37.2		75		50		37.9

Variola.—An epidemic of small-pox occurred on the Brooklyn, in which 5 cases, with a ratio of $8.18\frac{0}{100}$ happened. The cases were promptly sent on shore, and fortunately the epidemic did not become general.

Varioloides.—The single case of this affection which occurred was returned from the Marion, and was, upon its appearance, transferred to hospital.

CONSTITUTIONAL DISEASES.

The returns under this heading included 90 cases, giving a ratio of $147.29\frac{0}{100}$ a reduction from that of last year, which was $204.81\frac{0}{100}$. The loss of service was 757 days, and the daily average sick rate was 8.41. The number discharged to duty was 836, were invalided, with a ratio of $9.82\frac{0}{100}$ and 1 was continued. These affections occurred in the following ratios on the several ships:

Ships.	1879.	1880.	1881.	1882.
Shenandoah.....	90.90	92.10	336.18	539.32
Brooklyn.....	.....	.....	.....	86.56
Marion.....	.....	18.79	38.25	69.51

Adynamia.—One case of this affection was recorded on the Shenandoah, the ratio being $1.63\frac{0}{100}$, and the loss of service 16 days. The patient was invalided to hospital.

Anæmia.—A single case occurred on the Brooklyn, which, after 31 days of treatment on board, was invalided to hospital.

Lumbago.—The Brooklyn also reported 1 case of lumbago, which recovered after 5 days' treatment.

Podagra.—There were 5 admissions for gout, 3 on the Marion and 2

on the Shenandoah. The ratio contributed was $8.18\frac{0}{0}$, and the loss of time was 19 days. All were restored to duty after an average duration of 3.8 days.

Rheumatismus acutus.—In this squadron, 55 cases of acute rheumatism were reported, a ratio of $90.01\frac{0}{0}$, causing a loss of time of 274 days. The daily ratio of sick was $1.22\frac{0}{0}$, and the average duration of treatment was 4.98 days. There were 2 invalided to hospital, with a ratio of $3.27\frac{0}{0}$, and the remaining 52 recovered. The Shenandoah reported by far the largest number, 43; there were 11 on the Brooklyn, and but 1 on the Marion.

Rheumatismus chronicus.—The reports contained 18 cases of chronic rheumatism, giving a ratio of $29.45\frac{0}{0}$, and a loss of service of 219 days. They were equally divided between the Brooklyn and Marion, none occurring on the Shenandoah. The ratio of sick daily from this disease was $.98\frac{0}{0}$, and the average duration of treatment 12.16 days. One case was invalided to hospital, a ratio of $1.63\frac{0}{0}$.

Senectus.—The Brooklyn reported 1 man as unfit for duty by reason of old age, and he was transferred to hospital, for a disposition of his case.

Syphilis primitiva.—Only 2 cases of this malady occurred, and they were reported from the Brooklyn, recovering after a treatment of 4.55 days each. The ratio was $3.27\frac{0}{0}$.

Syphilis consecutiva.—There were 6 cases of secondary syphilis, 4 of which occurred on the Brooklyn, and 2 on the Shenandoah. The ratio was $9.82\frac{0}{0}$ as against $36.54\frac{0}{0}$ last year, and the loss of service was 100 days. All were restored to duty, the average period of treatment having been 16.66 days.

LOCAL DISEASES.

DISEASES OF THE NERVOUS SYSTEM.

Apoplexia.—The Brooklyn reported a fatal case of apoplexy.

Cephalalgia.—Three cases of this disease were recorded on the Marion, and 1 on the Shenandoah. The ratio of admission was $6.54\frac{0}{0}$ as against $9.83\frac{0}{0}$ last year, and the loss of service was 12 days. All returned to duty after an average duration of 3 days.

Dementia.—There were reported 3 cases of this malady from the Brooklyn, and 2 from the Marion; both these and 2 of the former were invalided to hospital. The ratio of admissions was $8.18\frac{0}{0}$, and the daily sick rate was $1.14\frac{0}{0}$, while the invaliding rate was $6.54\frac{0}{0}$. The loss of service was 256 days, an average of 51.2 for each case.

Insolatio.—One case of sunstroke occurred on the Brooklyn, and 1 on the Marion, the ratio being $3.27\frac{0}{0}$. The loss of time was 13 days, and both cases recovered after an average period of 6.5 days.

Meningitis.—The same ships returned each a case of meningitis, both of which were invalided to hospital, with an average loss of time of 76.5 days. The daily sick rate from this disease amounted to $.67\frac{0}{0}$, and the total loss of service was 153 days.

Nausea marina.—This trouble was so serious in 2 cases as to require a relief from duty, with a loss in each case of 2 days. Both were reported from the Brooklyn.

Neuralgia.—Ten cases of neuralgia were noted, giving a ratio of $16.36\frac{0}{0}$, and a daily sick rate of $.45\frac{0}{0}$. The total number of sick days was 103, and the average duration of treatment 10.30 days. Nine were returned to duty, the remaining 1 being continued. Eight occurred on the Brooklyn and 2 on the Marion.

Paralysis.—A single case of this disease was recorded on the Marion, and was invalided to hospital after 149 days of treatment, the daily sick rate having been $.66\frac{0}{0}$.

Pleurodynia.—A case of this trouble was noted on the Marion, and was briefly under treatment.

Sciatica.—The 2 cases of this disease reported occurred on the Brooklyn and were reported to duty after an average duration of 31.5 days, the daily sick rate being $.27\frac{0}{0}$.

Vertigo.—The same ship returned 2 cases, all of which speedily recovered.

DISEASES OF THE EYE.

The cases falling in this class were only 5 in number, of which 4 happened on the Brooklyn and 1 on the Marion. The ratio of admissions was $8.18\frac{0}{0}$, as against $7.24\frac{0}{0}$ last year. The number sick daily was $2.2\frac{0}{0}$, and the number of sick days 53. All recovered on board after an average period of treatment of 10.6 days. The cases on the Brooklyn were 3 of conjunctivitis and 1 of iritis, and the Marion had 1 of hordeolum.

DISEASES OF THE CIRCULATORY ORGANS.

Eight cases were reported of these affections, with a ratio of $13.09\frac{0}{0}$, with a loss of service of 81 days. The daily ratio of sick was $.36\frac{0}{0}$, and the average duration of treatment 10.12 days. One case invalided to hospital.

Palpitatio.—There were 6 cases of this affection, 1 occurring on the Brooklyn, 2 on the Marion, and 3 on the Shenandoah. The ratio of admission was $9.82\frac{0}{0}$, and of the daily sick $.31\frac{0}{0}$. Seventy days were lost and all the cases were discharged to duty, after an average period of treatment of 11.66 days.

Pericarditis.—A simple case of this disease was encountered on the Shenandoah, and was invalided to hospital on the 9th day.

DISEASES OF THE RESPIRATORY SYSTEM.

There were 92 cases noted under this head, a ratio $150.57\frac{0}{0}$, as against $120.48\frac{0}{0}$ last year, with the loss of service of 999 days. The daily rate of sick was $4.48\frac{0}{0}$, and the average duration of treatment 10.85 days. Eight were transferred to hospital, 82 returned to duty, and there were 2 deaths from pneumonia. The cases were most numerous on the Marion, which reported 44, next on the Brooklyn with 31, and then on the Shenandoah with 17.

The following table exhibits the distribution of the diseases of the respiratory organs on the various ships for the present and three preceding years:

Ships.	1879.	1880.	1881.	1882.
Marion		65.78	142.07	235.29
Shenandoah.....	86.77	65.78	103.44	190.78
Brooklyn				92.53

Bronchitis acuta.—Ten cases of acute bronchitis were returned, with a ratio of $16.36\frac{0}{0}$, as against $31.32\frac{0}{0}$ last year, and a loss of time equal to 67 days. The average number of sick daily was $.29\frac{0}{0}$, and the duration

of treatment 6.7 days. All the cases were restored to duty. The Shenandoah reported 5 cases, the Brooklyn 3, and the Marion 2.

Bronchitis chronica.—Two cases of this affection occurred on the Marion and 1 on the Brooklyn, all of which were invalided to hospital. The ratios for admission and invaliding were $4.90\frac{0}{0}$, and the loss of service 153 days, or 51 for each case, and the daily sick rate was $67\frac{0}{0}$.

Catarrhus.—There were returned from the Marion 34 cases, and from the Brooklyn 21, none occurring on the Shenandoah. The ratio of admission was $90.01\frac{0}{0}$, and the number of sick days 220. The daily ratio of sick was $.98\frac{0}{0}$, and the average duration of treatment 4 days, all recovering on board.

Hæmoptysis.—Two cases of this affection were returned from the Marion, with a ratio of $3.27\frac{0}{0}$, and a loss of service of 175 days. The daily ratio of sick was $.76\frac{0}{0}$, and the average duration of treatment 77.5 days, both cases returning to duty.

Laryngitis.—Six cases of this disease appear on the returns of the Shenandoah, a ratio of $9.82\frac{0}{0}$, and giving a loss of service equal to 21 days. All recovered after an average period of 3.5 days.

Phthisis pneumonia acuta.—A single case was treated on board the Brooklyn for 37 days, and then was able to return to duty.

Phthisis pneumonia chronica.—Four cases of this disease were met with, and were invalided to hospital, the cases being equally divided between the Brooklyn and Marion. The ratios produced were $6.54\frac{0}{0}$, the loss of service 178 days, and the daily average sick rate $.78\frac{0}{0}$.

Pleuritis.—Six cases of pleurisy were encountered, 5 on the Shenandoah and 1 on the Marion. The ratio of admissions was $9.82\frac{0}{0}$, as against $16.86\frac{0}{0}$ last year, and the number of sick days was 74. The average daily sick rate from this affection was $.32\frac{0}{0}$, and the average period of treatment 12.33 days. One case was invalided to hospital.

Pneumonia.—The ratio given by 5 cases of this disease was $8.18\frac{0}{0}$, and the loss of service 74 days. The cases occurred as follows: 3 on the Brooklyn, of which 2 died, and 1 each on the other ships. The daily average sick rate was $.32\frac{0}{0}$, and the average period of treatment 14.8 days. The death rate was $3.27\frac{0}{0}$.

DISEASES OF THE DIGESTIVE SYSTEM.

The returns contained mention of 88 cases under this head, a ratio of $144.02\frac{0}{0}$, almost the same as that last year, $142.16\frac{0}{0}$, although the loss of service was somewhat greater, 533 days, against 350 in 1881. The daily average sick rate was $2.38\frac{0}{0}$, and the average period of treatment 6.05 days. Six cases were invalided to hospital, 80 returned to duty, and 2 were continued.

The ratio of the occurrence of digestive disorders for the present and preceding years on the various ships is shown in the subjoined table:

Ships.	1879.	1880.	1881.	1882.
Shenandoah				269.66
Brooklyn				158.51
Marion				57.55

Cholera morbus.—The Brooklyn returned 2 cases of this affection, $3.27\frac{0}{0}$, which recovered after an average period of 3.5 days.

Colica.—There were returned 16 cases, a ratio of $26.18\frac{0}{0}$, as against $48.19\frac{0}{0}$ last year, and with a loss of 37 days. The daily average ratio of sick was $.37\frac{0}{0}$, and all the cases returned to duty after an average of

5.25 days of treatment. The cases were about equally distributed among the ships.

Constipation.—Three cases of this affection contributed a ratio of $4.90\frac{0}{00}$, and a loss of service of 9 days.

Diarrhœa acuta.—There were 28 cases of this disease reported, a ratio of $45.82\frac{0}{00}$, as against $4.81\frac{0}{00}$ last year, and the number of sick days was 94. The average ratio of sick daily was $.40\frac{0}{00}$, and the average duration of treatment 3.35 days. One patient was continued, all the others being returned to duty. The Brooklyn returned 15 cases, the Shenandoah 11, and the Marion but 2.

Diarrhœa chronica.—A single case of this affection was under treatment for 70 days on board the Marion, and was finally invalided to hospital.

Dyspepsia.—The Brooklyn returned 2 cases of dyspepsia, which were under treatment 9 days.

Enteritis.—The five cases noted of this affection occurred on the Brooklyn, and gave a ratio of $8.18\frac{0}{00}$, and a loss of 26 days' time. Three recovered, 1 was invalided to hospital, and 1 continued.

Gastrodynia.—A single case of this affection was noted on the Brooklyn, with a ratio of $1.63\frac{0}{00}$, and was discharged to duty after 40 days.

Hæmorrhoids.—Seven cases were mentioned, 3 occurring on the Marion and Shenandoah, respectively, and one on the Brooklyn. The ratio was $11.45\frac{0}{00}$, and the number of sick days 114; the average daily ratio of sick was $.50\frac{0}{00}$, and the average duration of treatment 16.28 days. All recovered on board.

Hernia.—Four cases of this trouble were equally divided between the Brooklyn and Shenandoah, contributing a ratio of $6.54\frac{0}{00}$, and a loss of 27 days. Two cases were returned to duty, and 2 sent to hospital, the ratio in each case being $3.27\frac{0}{00}$.

Pharyngitis.—There were 14 cases of this affection, a ratio of $22.91\frac{0}{00}$, and causing a loss of time of 65 days. The daily average sick rate was $27\frac{0}{00}$, and the average duration of treatment 4.64 days, all the cases recovering.

Rhagades ani.—The Shenandoah returned one case of this trouble, which was under treatment for 14 days.

Stomatitis.—The Brooklyn had two cases, the ratio being $3.27\frac{0}{00}$, and the average period of treatment 3.5 days.

Vermes.—The same ship reported 2 cases of this affection, which speedily returned to duty.

DISEASES OF THE GENITO-URINARY SYSTEM.

The number of entries under this head was 34, and the ratio of sickness $55.64\frac{0}{00}$, somewhat larger than that of last year, viz, $38.55\frac{0}{00}$. The loss of service was 504 days, as against 154 last year. The daily average ratio of sick was $1.80\frac{0}{00}$ and the average duration of sickness 11.88 days. Four cases were invalided to hospital, the ratio being $6.54\frac{0}{00}$; 1 was continued, and 29 recovered.

The ratios of the diseases of the genito-urinary system, as distributed among the ships, stand as follows:

Ships.	1879.	1880.	1881.	1882.
Marion		11. 27	21. 85	64. 17
Brooklyn				53. 73
Shennandoah	20. 65	31. 95	51. 72	44. 95

Albuminuria.—The Brooklyn and Marion each reported 1 case of Bright's disease, the latter being invalided to hospital, while the former terminated fatally. The admission ratio was $3.27\frac{0}{00}$, and that of the daily sick $.32\frac{0}{00}$. The number of sick days were 70, and the average duration of treatment 38 days.

Chancroides.—Of this malady there were 6 cases, 3 on the Marion, 2 on the Brooklyn, and the remaining 1 on the Shenandoah. The ratio was $9.82\frac{0}{00}$, rather smaller than last year, when it was $12.04\frac{0}{00}$. The loss of service was 65 days, as against 28 last year. There was a ratio of sick daily of $.27\frac{0}{00}$, and an average duration of treatment of 10.83 days.

Cystitis.—A single case of this disease was under treatment on the Brooklyn for 12 days.

Dysuria.—The Shenandoah returned 1 case, with a loss of service of 11 days before recovery.

Gonorrhœa.—There were 10 admissions to the sick list for this malady, giving a ratio of $16.36\frac{0}{00}$, as against $9.63\frac{0}{00}$ last year. The total loss in time was 131 days, and the average number sick daily was $.57\frac{0}{00}$. All the cases returned to duty after an average period of 13.10 days. Seven cases occurred on the Brooklyn, and the remainder on the Marion.

Orchitis.—Eight cases were noted under this head, 5 on the Brooklyn, 2 on the Marion, and one on the Shenandoah. The ratio of admissions was $13.09\frac{0}{00}$, and that of the daily sick $.40\frac{0}{00}$. The number of sick days was 93, or 11.62 for each man.

Paraphimosis.—A single case of this character was under treatment for 14 days on the Marion, and was successfully treated on board.

Urethræ stricturæ.—There were 4 admissions for urethral stricture, 2 on the Brooklyn and Marion, respectively, the latter being invalided to hospital. The ratio for admissions was $6.54\frac{0}{00}$, and for the daily sick $.08\frac{0}{00}$, while the average period of treatment was 4.75 days.

Varicocele.—One case was noted on the Shenandoah, which was invalided to hospital after 83 days of treatment.

DISEASES OF THE INTEGUMENTARY SYSTEM.

This class of diseases yielded a total of 73 cases, a ratio of $119.47\frac{0}{00}$, as against $110.84\frac{0}{00}$ last year. The total number of sick days was 591, and the average sick rate was $2.63\frac{0}{00}$. All the cases, with 1 exception, which were invalided, returned to duty, the average duration of treatment having been 8.09 days.

The following table shows the comparative prevalence of these diseases:

Ships.	1879.	1880.	1881.	1882.
Brooklyn				134.32
Shenandoah	37.17	56.38	112.06	112.35
Marion		33.83	109.28	80.21

Abscessus.—There were returned 22 cases of abscess, 20 from the Brooklyn, and 2 from the Marion, giving a ratio of $36.0\frac{0}{00}$, as against $4.81\frac{0}{00}$ in 1881. The loss of service was 130 days, and the average ratio of sick daily $.57\frac{0}{00}$. All the cases were cured after an average period of 5.90 days.

Acne.—The Shenandoah reported 1 case, which was transferred to hospital.

Cellulitis.—There were 3 cases of this disease treated on the Marion, contributing a ratio of $4.90\frac{0}{0}$, and a loss of 58 days' service. The daily average rate of sick was $24\frac{0}{0}$, and the cases finally recovered after an average period of 19.33 days.

Furunculus.—There were noted 30 cases of boils on the various ships, the ratio contributed being $49.09\frac{0}{0}$, as against $26.50\frac{0}{0}$ last year. The number of sick days was 202, and the number of sick daily $.90\frac{0}{0}$. The average period of treatment was 6.73 days.

Impetigo.—Two cases of this eruption were recorded on the Brooklyn, and were restored to duty after an average period of 3.5 days.

Paronychia.—Seven cases of this disease were returned, a ratio of $11.45\frac{0}{0}$, as against $21.98\frac{0}{0}$ last year. The time lost was 79 days, an average of 11.28 for each case.

Ulcus.—Seven cases of ulcer were entered on the records, of which 4 occurred on the Brooklyn, 2 on the Shenandoah, and 1 on the Marion. The ratio was $11.45\frac{0}{0}$, and the number of sick days 111, making the average duration of treatment 15.85 days. The daily ratio of patients was $.49\frac{0}{0}$.

Urticaria.—A case of this eruption was reported from the Shenandoah, which speedily returned to duty.

DISEASES OF THE ABSORBENT SYSTEM.

Included under this head were 12 cases of adenitis, contributing a ratio of $19.63\frac{0}{0}$ as against $21.68\frac{0}{0}$ last year, and a loss in time of 307 days. The daily ratio of sickness was $.11\frac{0}{0}$, and the average duration of treatment 2.25 days. There were 7 on the Brooklyn, 4 on the Marion, and 1 on the Shenandoah, and all recovered on board.

POISONS.

Seventeen cases of sickness resulted from excessive use of alcoholic stimulants, of which 9 were on the Brooklyn, 5 on the Marion, and 2 on the Shenandoah. The ratio given was $27.82\frac{0}{0}$ as against $21.68\frac{0}{0}$ last year, and the time lost amounted to 43 days, or 2.52 days for each case.

VIOLENT DISEASES.

A total of 145 cases of injuries were recorded, making a ratio of $237.31\frac{0}{0}$, almost the same as that of 1881, which was $236.14\frac{0}{0}$. There was a loss of 1,423 days in time, and the daily average ratio of sickness was $6.41\frac{0}{0}$. Four cases were invalided to hospital, the ratio being $6.54\frac{0}{0}$, 1 was continued, and the others were returned to duty, the average period of treatment having been 9.87 days.

In the following table is shown the ratios of injuries as they occurred on the several ships, compared with those of preceding years.

Ships.	1879.	1880.	1881.	1882.
Shenandoah.....	99.16	253.75	262.91	370.78
Brooklyn				226.86
Marion		75.18	202.18	192.51

Abrasio.—Four cases of this injury were reported, with a ratio of $6.54\frac{0}{0}$ as against $12.04\frac{0}{0}$ in 1881, and a loss of $6.54\frac{0}{0}$. They recovered after a period of treatment of 3.5 days.

Ambustio.—There were 4 cases of burns equally divided between the Marion and Shenandoah. They were restored to duty after an average period of treatment of 3.5 days.

Concussio cerebri.—The single case of this injury occurred on the Marion and recovered after 9 days.

Contusio.—There were 58 cases of contusion affording a ratio of $94.92\frac{0}{0}$ as against $81.92\frac{0}{0}$ in 1881. There was a resulting loss of time of 450 days, and the daily average ratio of sickness was $2.01\frac{0}{0}$. Fifty-seven cases were returned to duty, after an average duration of treatment of 7.75 days, and the remaining case was sent to hospital. The cases were distributed in nearly equal ratios to the several ships.

Fractura.—Seven cases of fracture occurred, a ratio of $11.45\frac{0}{0}$, and causing a loss in time of 307 days. Four cases were restored to duty, and the remaining 3 were invalided to hospital, the average duration of treatment having been 43.85 days. Four cases were on the Brooklyn, 2 on the Shenandoah, and 1 on the Marion.

Luxatio.—There were 2 cases of dislocation reported from the Marion, which were each under treatment for 22.5 days, and recovered, the daily average ratio of sickness being $.19\frac{0}{0}$.

Stemma.—This injury occurred in 26 cases, 18 of which were on the Brooklyn. The ratio for admissions was $42.55\frac{0}{0}$, and the daily average ratio $.75\frac{0}{0}$. The loss of time was 147 days, or 5.68 for each case.

Vulnus contusum.—The contused wounds in this squadron numbered 21, giving a ratio of $34.36\frac{0}{0}$, as against $43.37\frac{0}{0}$ last year. The amount of sick days was 175, or 8.33 days for each case, and the daily average sickness was $.76\frac{0}{0}$. One case was invalided to hospital.

Vulnus incisum.—Ten cases were noted under this head, the ratio being $16.36\frac{0}{0}$. The loss of time was 68 days, and the daily average sick rate $.29\frac{0}{0}$. Six cases occurred on the Brooklyn and 3 on the Marion; none were invalided.

Vulnus laceratum.—Four cases of lacerated wounds were reported from the Brooklyn, and 3 from the Marion, with a ratio of $11.45\frac{0}{0}$, and a consequent loss of of service of 132 days. The daily average sick rate was $.58\frac{0}{0}$, and the average duration of treatment 18.35 days; all the cases recovering.

Vulnus punctum.—There were 5 cases of punctured wounds, 4 of which happened on the Brooklyn and 1 on the Marion. The ratio was $8.18\frac{0}{0}$, and the loss of service was 45 days. The ratio of the number sick daily was $.19\frac{0}{0}$. All the cases recovered after an average duration of treatment of 9 days.

NAVAL HYGIENE.

BROOKLYN.

This vessel served during the year as flag-ship of the South Atlantic Squadron. In the early part of the year she cruised from Montevideo, as far south as the Straits of Magellan and the Falkland Islands. Returning she went to Rio de Janeiro for the winter months, and was at Montevideo during the remainder of the year. During the year, she was in port 301 days, and at sea 64 days.

In the zymotic class of diseases there were reported from this ship 44 cases, contributing a ratio of $131.34\frac{0}{0}$, with the loss of service of 253 days. The diseases returned were chiefly as follows: erysipelas 4, febricula 16, febris simplex continua 5, febris intermittens 14, variola 5. These last were promptly invalided, as was a case of the previous disease, the ratio of invaliding being $17.91\frac{0}{0}$. The average ratio of the daily sick was $2.06\frac{0}{0}$, and the average duration of treatment 5.75 days.

There were returned 29 cases of constitutional affections, comprising 20 cases of rheumatismus, 6 of syphilis, and 1 each of senectus, lumbago, and adynamia. The ratio of admissions was $86.56\frac{0}{0}$, and the loss of service 396 days. The daily average ratio of sick was $3.22\frac{0}{0}$, and the average duration of treatment 13.65 days. The ratio given by 3 cases invalided was $8.95\frac{0}{0}$.

The diseases of the nervous system numbered 20, the ratio being $59.70\frac{0}{0}$, and the loss of service 296 days. The cases were: dementia 3, neuralgia 8, nausea marina 2, and single cases, apoplexia (which was fatal), insolatio, and meningitis. The average number of sick daily was $2.41\frac{0}{0}$, and the duration of treatment 14.8 days. There were 3 cases of invaliding, with a ratio of $8.95\frac{0}{0}$.

The returns included 31 cases of affections of the respiratory organs, the principal factor of which was catarrhus, 21 cases, and there were 3 of pneumonia, 2 proving fatal, and 3 of phthisis pulmonalis. The ratio of sickness was $92.53\frac{0}{0}$, the average number sick daily being $2.29\frac{0}{0}$. The duration of treatment averaged 9.12 days. Three were invalided, or $8.95\frac{0}{0}$, and 2 died, the ratio being $5.97\frac{0}{0}$.

There were 52 entries under the head of diseases of the digestive system, making a ratio of $158.21\frac{0}{0}$, with a daily sick rate of $1.76\frac{0}{0}$. The total number of sick days was 218, and the average duration of treatment 4.11. One case each of enteritis and hernia was invalided with a ratio of $5.97\frac{0}{0}$. The chief factors in the class were diarrhœa acuta 15, and pharyngitis 14.

There were 18 cases of genito-urinary affections, made up chiefly of 7 cases of gonorrhœa, 5 of orchitis, 2 each of chancroides and urethræ stricture, and 1 of albuminuria, which was fatal. The ratio of admissions was $53.73\frac{0}{0}$, and for the number of sick daily $1.76\frac{0}{0}$. There were 218 sick days, and the average duration of treatment was 12.11 days. The death ratio was $2.98\frac{0}{0}$.

The skin diseases were 48 in number, with the ratio of $134.32\frac{0}{0}$, and the loss of 350 days in service. The cases were chiefly 20 of abscessus, 17 of furunculus, and 5 of urticaria. The daily ratio of sickness was $1.49\frac{0}{0}$, and the average duration of treatment 26.42 days; all the cases recovered on board. Diseases resulting from violence gave a total of 76 cases, with a ratio of $226.86\frac{0}{0}$. The loss of service amounted to 670 days, and the daily ratio of sick averaged $5.46\frac{0}{0}$. All were restored to duty after an average period of treatment of 8.81 days.

Medical Inspector C. H. Burbank gives in his sanitary report the following account of the ventilation on board the Brooklyn:

In considering the air space and the ventilation of this ship, it is convenient to divide the berth-deck into three sections, the first being that part forward of the engine-room where the men are berthed, having an air capacity of 22,612 cubic feet; the second, that part abaft the former as far as the wardroom bulkhead, including dispensary, rooms of warrant officers, steerage quarters, and country, &c., having an air space of 10,386 cubic feet; and the third section, the wardroom, including state-rooms, 8,980 cubic feet.

Section 1 is occupied by 216 men, making an air space of 104.6 cubic feet for each. Section 2 is occupied by 17 persons, giving 609.9 cubic feet to each. Section 3 is occupied by 16 officers, giving to each 561.2 cubic feet. The ordinary means of supplying air are: In section 1, three hatchways, one opening under the top-gallant fore-castle, and the air ports; in section 2, two hatchways and air ports; in section 3 are two ordinary hatchways, air ports, and a ventilating shaft in the after end of wardroom leading to the poop. In addition to the above means of supplying air to the ship, there are on board two Sturtevant steam fan blowers, which can be made to draw fresh air from the outside atmosphere through the engine-room ventilators and drive it through a series of metallic pipes to different parts of the ship; or the current being reversed by means of opening and closing certain valves connected with the blowers, exhausts the air from the ship and drives it out through the same ventilators, fresh air rushing in to take the place of that exhausted, through the hatchways and all other apertures opening into the interior of the vessel from the outside.

In section 1 there are 14 air-ducts, with a total area of 1.20 square feet; in section 2, 12 air-ducts with area of 1.02 square feet; in section 3, 16 air-ducts with an area of 1.37 square feet.

With the engines running at the ordinary speed, 201 revolutions per minute, the velocity of the air through these ducts is found by experiments with the anemometer to be at the rate in section 1 of 846.8 feet per minute; in section 2, 1,025.4 feet; and in section 3, 912.2; supplying in section 1, 61,030.3 cubic feet of air per hour, by exhaustion; in section 2, 63,344.9 feet; and in section 3, 75,135.9 feet; giving to each individual in section 1, 282 cubic feet per hour; in section 2, 3,725 feet; and in section 3, 4,695 feet.

In section 1 the air is changed 2.69 times per hour; in section 2, 6.10 times, and in section 3, 8.35 times; whereas in order to give each individual 2,000 cubic feet of air per hour the air should be changed in section 1 19.1 times per hour, but in section 2 it should be changed only 3.27, and in section 3, 3.56 times. Although it is said, that a change of air of more than 6 times an hour will produce a draught, and therefore be injurious in that regard, it is evident that such a change would not be sufficient in section 1 to reduce the carbonic acid gas to anything like a healthy standard, as any amount above 1 volume of the gas per 1,000 volumes of air is said to be more or less injurious in proportion to the increase; and such a change would give only 135,672 feet per hour altogether, or to each individual but 628 cubic feet. It will be seen that the greatest possible supply from the blowers in section 1 is much too small, the deficiency being 370,970 feet per hour, while in section 2 the excess of necessary supply is 29,344, and in section 3, 43,135 feet.

By comparing the figures above, it will be seen that the air-ducts are not properly distributed through the different parts of the ship; for in section 1, which is occupied by 216 men, there are fewer ducts, a smaller total area, and less velocity of air than in section 3, which is occupied by only 16 officers. As, in order to give to each occupant in section 3 an equal share of ventilation, it is necessary to have an air-duct in each room, they should be of smaller size than those in section 1, in proportion to the number of times the air should be changed per hour, in accordance with the number of occupants and cubic feet of air to be renewed, while the number or size of ducts in section 1 should be increased in the same ratio.

The ducts in the hold and store-room below the berth-deck should be of much smaller size than those on the berth-deck, as it is not necessary to change the air in those places as often as where people live, but only often enough to keep the air in good condition for the preservation of stores. A change of once or twice an hour would

be sufficient, as none of the oxygen of the air is consumed or carbonic acid evolved as in the living quarters of the ship.

Exhausting or drawing the air from a space is believed to be a much better way of ventilation than forcing air in, as it sets in slow motion toward the air-ducts a larger part or the whole mass of air, whereas when forced in the stream of air seems to be driven into or through the still mass of air to some place of exit, leaving some portions wholly unchanged, at least for a long time. Especially on board ship, where the ventilating pipes lead into the hold and bilge (or bilge well, as in this ship), is exhaustion much better than forcing air in, as in the latter case the foul air of the bilge and hold would be driven up through the hatchways to the berth-deck occupied by the crew and officers.

Air, in passing through a space or room, will take the shortest route from the entrance to the exit; therefore to change the mass of air in an apartment the two points should be at the extremes, upper and lower. In this ship the air-duct openings are in the upper part of the berth-deck air space. As the air enters through the hatches and air ports when exhausting, or vice versa when forcing air in, it follows that the air passes in and out through the upper part, without touching the lower stratum of air where the carbonic acid gas gravitates by its weight. As this is the principal poisonous gas to be gotten rid of, it follows, that ventilation fails in its office if it does not accomplish this. To more effectually carry away this lower stratum of impure air the duct openings should be in the lower part of the berth-deck air space, in order to set in motion the whole volume of air, and especially to carry off the lower and most impure air. The following results of experiments for carbonic acid gas, carefully made, show the difference in the quantity of the latter in the air of the upper part of the berth-deck space and the lower, simultaneously, and under different conditions of ventilation and temperature.

Place.	Date.	Weather.	Carbonic acid corrected for temperature per 1,000 volumes.	Temperature.	Remarks.
Keel Point, Patagonia.	1882. Dec. 14	Cloudy .	Top of berth-deck space, 1.17; bottom of berth-deck space, 1.24.	60	Berth-deck, forward, 11 p. m. Air ports closed.
At sea	Dec. 16	Clear . . .	Top of berth-deck space, 1.08; bottom of berth-deck space, 1.96.	69	Wardroom country, 9.45 p. m. Doors and hatchways closed and 5 large lamps burning.
	Dec. 20	Cloudy .	Top of berth-deck space, 1.26; bottom of berth-deck space, 1.42.	67	Wardroom country, 9.45 p. m. hatches and doors closed, and 5 large lamps burning.
	Dec. 22	Clear . . .	Top of berth-deck space, 1.78; bottom of berth-deck space, 1.89.	72	Berth-deck, forward, 4 a. m. Blowers exhausting, but not working well. No wind.
	Dec. 23	Cloudy .	Top of berth-deck space, 0.99; bottom of berth-deck space, 1.24.	76	Berth-deck, amidships, 5 a. m. Port side. Blowers exhaust- ing on port side.

The average difference is about 3 volumes in 10,000 more of carbonic acid gas in the lower than in the upper stratum of air. Other experiments were made with about the same result.

If possible, this gas should be drawn off from the bottom, that it may not be mixed with the upper air, which is breathed; and this would be best accomplished by exhausting through openings near the lower part of the space.

The valves closing the air-ducts are defective, not being tight, allowing gases to escape from the duct. As the air-ducts open into the hold and bilge, the practical result is that the foul air from these places escapes into the living quarters of the ship when the blowers are not in motion. Air-tight valves should be fitted to the ducts in different parts of the ship, so that they could be shut off when desirable to prevent the escape of gas from the bilge into other localities, and to facilitate ventilation of any special region. There being no donkey boiler on board this vessel, the blower is seldom used. The valve now in use, when opened to its fullest extent, shuts off one-half of the area of the air-duct. A great improvement would be to substitute for it, in section 1, a valve which would leave open the whole area of the air-duct, which could be easily done. Even this great improvement would give to each man in that section not more than 500 cubic feet per hour, showing how very defective is this part of the ship in ventilation compared with other parts. There are a large number of ventilating openings on the inside of the bulwarks leading to the bilge, between the skin of the ship, which answer a good purpose. There are also twenty of these openings under the top-gallant fore-castle, where nearly one hundred men sleep, and where the crew assemble during the day, especially in stormy weather. It is evident that if there are any dele-

terious gases generated in the bilge, they will (and do) escape through these ventilators, to the detriment of the health of those occupying this place. These ventilators should open into the outside air.

The sick bay is a small room situated about midships on the port side, the length of which is 15 feet 3 inches; width, 9 feet; and height, 6 feet 6 inches, containing 890 cubic feet of air. Connecting with this is a water-closet and bath-room combined in one apartment. It can be seen that the sick quarters in this vessel are altogether too small. With a crew of 300, only two sick men in cots or hammocks can be accommodated at once, placed in one end of the room, being very much crowded, and leaving only working room at the other end. Opening into this room are two air-ducts, included among the 14 in section 1. In a ship of this size the quarters for the sick should be two or three times as large. It would be better to have two rooms, in order to be able to isolate cases of contagious disease and those who are seriously ill.

The vessel can be heated by steam when desired.

The health of the ship and station has been unusually good during the year.

MARION.

The first three months of the year was spent by this ship at Montevideo. From thence she sailed to Cape Town, Africa, and to Heard's Island in search of a wrecked vessel. In the latter part of the year she returned to the United States, arriving towards the close of December, having passed at sea, during the year, 155 days, and in port 200 days.

The returns from this ship included 35 cases of zymotic diseases, contributing a ratio of sickness of $187.16\frac{0}{0}$, and a loss of service of 274 days. There was an average ratio of daily sickness of $4.11\frac{0}{0}$, and an average duration of treatment of 7.82 days. The cases were chiefly of intermittent fever, 16 cases occurring, and of vaccina, of which there were 13. A case of variola having occurred on board at Montevideo, it was immediately transferred to hospital, and the whole company were vaccinated; hence the large number temporarily disabled from this cause. The invaliding consisted of 1 case of variola, a ratio of $5.34\frac{0}{0}$.

The constitutional diseases contributed 13 cases, a ratio of $69.51\frac{0}{0}$, of which none were invalided. The loss of service was 97 days, and the daily average number of sick $1.44\frac{0}{0}$. The cases reported were 3 of podagra, and 10 of rheumatism.

Diseases of the nervous system yielded 10 cases, and a ratio of admissions of $53.46\frac{0}{0}$, as against $27.32\frac{0}{0}$ in 1881. The number of sick days amounted to 458, and the average duration of treatment to 45.8 days. The average number of sick daily was $6.89\frac{0}{0}$, and 4 cases invalided gave a ratio of $21.39\frac{0}{0}$. The principal cases were 2 of dementia, 1 of meningitis, 1 of paralysis—all invalided—and 1 of insolation.

There were admitted 44 cases of diseases of the respiratory organs, which yielded the large ratio of $235.29\frac{0}{0}$, as against $142.07\frac{0}{0}$ last year, and loss of service of 609 days. The most considerable factor in this class was catarrhus, of which there were 34 cases, and there were single case of pleurisy and pneumonia, as well as 2 of phthisis pulmonalis, both of which were invalided.

There were reported 11 cases of diseases of the digestive system, 5 of colica, and 3 of diarrhœa and hæmorrhœis, respectively. The ratio was $57.75\frac{0}{0}$, as against $92.89\frac{0}{0}$ last year, and the loss of service 212 days. There was an average daily sick rate of $3.15\frac{0}{0}$, and the average duration of treatment was 19.18 days. Two were invalided, a ratio of $10.69\frac{0}{0}$.

There were 12 cases of diseases of the genito-urinary system, with a ratio $64.17\frac{0}{0}$, more than double that of last year, which was $21.85\frac{0}{0}$. The daily rate of sickness was $2.40\frac{0}{0}$, and the loss of service 163 days, an average per case of 13.58 days. One case of albuminuria and 2 of strictura urethræ were invalided, the ratio being $16.04\frac{0}{0}$.

Fifteen cases were included in the class of integumentary diseases,

giving a ratio of $80.21\frac{0}{0}$, as against $109.28\frac{0}{0}$ in 1881. The daily ratio of sickness from these affections averaged $1.81\frac{0}{0}$, and the loss of service was 121 days, or 30.27 for each case.

From diseases of violence there were 36 cases recorded, the ratio being $192.57\frac{0}{0}$, and the consequent loss of service 273 days. There was a daily ratio of sickness of $4.06\frac{0}{0}$, and an average duration of treatment of 7.58 days. One case of fracture and 1 of vulnus contusum were invalided to hospital, giving a ratio of $10.69\frac{0}{0}$.

Surgeon H. J. Babin, in his sanitary report, remarks as follows:

Since my last report the ventilation of the after parts of the ward-room and shaft-alley has been greatly improved by the introduction of two ventilating funnels leading from the pantry and after part of the shaft-alley to the poop-deck. These funnels are disconnected, about 10 inches in diameter, and so constructed as only to allow a gradual curve in their course outward.

The current through these is almost invariably outboard, and thus a ready escape is afforded to the foul unwholesome air that was wont to collect and bank up in the localities above mentioned. The bilge has been kept scrupulously clean, and in consequence of the alterations just alluded to has been entirely devoid of offensive smells, except in very heavy weather at sea, and it would seem as though the sanitary measures adopted after the outbreak of yellow fever which occurred on board in 1880, had proved effectual in eradicating the germs of the disease.

SHENANDOAH.

This ship sailed from Montevideo on her return home about February 1, and she reached Boston about the close of the first half year, where she went out of commission. On her passage home she visited a number of the West India islands. She was at sea 64 days, and in port 82 days.

The entries under the head of zymotic diseases were 6, of which 3 were simple continued fever, and 3 malarial in origin. The ratio of admissions was $67.41\frac{0}{0}$, of the daily sick $2.92\frac{0}{0}$, and there was a loss of 38 days, or 6.33 for each case.

The constitutional diseases numbered 48 cases, giving a ratio of $539.32\frac{0}{0}$. These excessively large figures were due to the number of cases of acute rheumatism reported, 48, of which 2 were invalided. The loss of service was 264 days, and the average duration of treatment 5.5 days.

The respiratory system afforded 17 cases, 5 each of pleuritis and bronchitis chronica, 6 of laryngitis, and 1 of pneumonia. The ratio was $190.78\frac{0}{0}$ and the average daily sickness 8.20. There were 107 sick days, and the average duration of treatment was 6.29 days. One was invalided, the ratio being $11.23\frac{0}{0}$.

There were returned 24 cases of diseases of the digestive system, contributing a ratio of $269.66\frac{0}{0}$, and a loss of 103 days. The daily average sick rate was $7.86\frac{0}{0}$, and the average duration of treatment 4.29 days. Two were invalided, making the ratio $22.47\frac{0}{0}$.

The genito-urinary system contributed only 4 cases, or $44.95\frac{0}{0}$, of which 1, or $11.23\frac{0}{0}$, was invalided. The loss of service was 123 days.

There were 10 cases of skin diseases, one-half of which were furunculus. The ratios were, admissions $112.35\frac{0}{0}$, invaliding $11.23\frac{0}{0}$, daily sick $6.85\frac{0}{0}$, and the loss of time was 90 days.

From injuries there were 33 cases of sickness, with a ratio of $370.78\frac{0}{0}$, and a daily ratio of sick of $37.52\frac{0}{0}$. The loss of service amounted to 489 days, and the average duration of treatment was 14.81 days. Two cases of contusion, a rate of $22.47\frac{0}{0}$, were invalided to hospital.

TABLE I.—*Showing the force on each ship, the number admitted and discharged, number*

Vessels.	Strength.	Strength corrected for time.	Admitted.					Total.
			Remaining from last year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	
Brooklyn, second rate, 1,600 tons, wood, screw; service, 365 days	335	335	10	96	100	77	61	344
Marion, third rate, 910 tons, wood, screw; service, 355 days	192	187	5	30	62	53	41	191
Shenandoah, second rate, 929 tons, wood, screw; service, 146 days	221	89	6	79	67	.....	.....	152
Total	748	611	21	205	229	130	102	687

of days under treatment, and average per thousand of force on the South Atlantic Station.

Discharged.					Continued.	Number of sick days.	Average number of days under treatment.	Daily average number of sick.		Number admitted per thousand of force.
Cured.	Invalided.		Died.	Total.				Absolute.	Per thousand of force.	
	To hospital.	From the service.								
317	18	.....	4	339	5	3,065	8.91	8.39	25.04	1,026.86
174	17	.....	.....	191	.....	2,453	12.84	6.91	36.95	1,020.83
141	11	.....	.....	152	.....	1,288	8.47	8.82	99.10	1,707.86
632	46	.....	4	682	5	6,806	9.90	18.64	30.50	1,124.38

TABLE II.—Showing the number of cases, the discharged, invalided, and dead

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Erysipelas	4	6.54	20
Febricula	18	29.45	117
Febris continua simplex	10	16.36	122
Febris enterica	1	1.63	41
Febris intermittens	32	52.37	157
Febris remittens	1	1.63	13
Vaccina	13	21.27	81
Variola	5	8.18	13
Varioloides	1	1.63	1
Total	85	139.11	565
II.—CONSTITUTIONAL DISEASES.			
Adynamia	1	1.63	16
Anæmia	1	1.63	31
Lumbago	1	1.63	5
Podagra	5	8.18	19
Rheumatismus acutus	55	90.01	274
Rheumatismus chronicus	18	29.45	219
Senectus	1	1.63	2
Syphilis primitiva	2	3.27	91
Syphilis consecutiva	6	9.82	100
Total	90	147.29	757
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Apoplexia	1	1.63	1
Cephalalgia	4	6.54	12
Dementia	5	8.18	256
Insolatio	2	3.27	13
Meningitis	2	3.27	153
Nausea marina	2	3.27	4
Neuralgia	10	16.36	103
Paralysis	1	1.63	149
Pleurodynia	1	1.63	2
Sciatica	2	3.27	63
Vertigo	2	3.27	2
Total	32	52.37	758
II.—DISEASES OF THE EYE.			
Conjunctivitis	3	4.90	29
Hordeolum	1	1.63	9
Iritis	1	1.63	15
Total	5	8.18	53
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Palpitatio	6	9.82	70
Pericarditis	1	1.63	9
Syncope	1	1.63	2
Total	8	13.09	81
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Bronchitis acuta	10	16.36	67
Bronchitis chronica	3	4.90	153
Catarrhus	55	90.01	220
Hæmoptysis	2	3.27	175
Laryngitis	6	9.82	21
Phthisis pneumonica acuta	1	1.63	37
Phthisis pneumonica chronica	4	6.54	178
Pleuritis	6	9.82	74
Pneumonia	5	8.18	74
Total	92	150.57	999

for each disease, and their ratio $\frac{0}{0}$ of force, on the South Atlantic Station.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.05	.08	5	4	6.54							
.32	.52	6.5	18	29.45							
.33	.54	12.20	10	16.36							
.11	.18	41	1	1.63							
.43	.70	4.90	31	50.73	1	1.63					
.03	.04	13	1	1.63							
.22	.36	6.32	13	21.27							
.03	.04	2.6			5	8.18					
		1			1	1.63					
1.54	2.52	6.64	78	127.65	7	11.45					
.04	.06	16			1	1.63					
.08	.13	31			1	1.63					
.01	.01	5	1	1.63							
.05	.08	3.8	5	8.18							
.75	1.22	4.98	52	85.10	2	3.27					1
.60	.98	12.16	17	27.82	1	1.63					
		2			1	1.63					
.24	.39	45.5	2	3.27							
.27	.44	16.66	6	9.82							
2.07	3.38	8.41	83	135.84	6	9.82					1
		1							1	1.63	
.03	.04	3	4	6.54							
.70	1.14	51.2	1	1.63	4	6.54					
.03	.04	6.5	2	3.27							
.41	.67	76.5			2	3.27					
.01	.01	2	2	3.27							
.28	.45	10.30	9	14.73							1
.40	.66	149			1	1.63					
		2	1	1.63							
.17	.27	31.5	2	3.27							
		1	2	3.27							
2.07	3.38	23.68	23	37.64	7	11.45			1	1.63	1
.07	.11	9.66	3	4.90							
.02	.03	9	1	1.63							
.04	.06	15	1	1.63							
.14	.22	10.6	5	8.18							
.19	.31	11.66	6	9.82							
.02	.03	9			1	1.63					
		2	1	1.63							
.22	.36	10.12	7	11.45	1	1.63					
.18	.29	6.7	10	16.36							
.41	.67	51			3	4.90					
.60	.98	4	55	90.01							
.47	.76	77.5	2	3.27							
.05	.08	3.5	6	9.82							
.10	.16	37	1	1.63							
.48	.78	44.5			4	6.54					
.20	.32	12.33	5	8.18	1	1.63					
.20	.32	14.8	3	4.90					2		
2.73	4.46	10.85	82	134.20	8	13.09			2	3.27	

TABLE II.—Showing the number of cases, the discharged,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Cholera morbus.....	2	3.27	7
Colica.....	16	26.18	84
Constipatio.....	3	4.90	9
Diarrhœa acuta.....	28	45.82	94
Diarrhœa chronica.....	1	1.63	70
Dyspepsia.....	2	3.27	9
Enteritis.....	5	8.18	26
Gastrodynia.....	1	1.63	4
Hæmorrhœis.....	7	11.45	114
Hernia.....	4	6.54	27
Pharyngitis.....	14	22.91	65
Rhagades ani.....	1	1.63	14
Stomatitis.....	2	3.27	7
Vermes.....	2	3.27	3
Total.....	88	144.02	533
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria.....	2	3.27	76
Chancroides.....	6	9.82	65
Cystitis.....	1	1.63	12
Dysuria.....	1	1.63	11
Gonorrhœa.....	10	16.36	131
Orchitis.....	8	13.09	93
Paraphymosis.....	1	1.63	14
Urethræ strictura.....	4	6.54	19
Varicocele.....	1	1.63	83
Total.....	34	55.64	504
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Arthritis.....	2	3.27	35
Ankylosis.....	1	1.63	34
Ostitis.....	1	1.63	64
Synovitis.....	2	3.27	50
Total.....	6	9.82	183
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus.....	22	36.00	130
Acne.....	1	1.63	1
Cellulitis.....	3	4.90	58
Furunculus.....	30	49.09	202
Impetigo.....	2	3.27	7
Paronychia.....	7	11.45	79
Ulcus.....	7	11.45	111
Urticaria.....	1	1.63	3
Total.....	73	119.47	591
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis.....	12	19.63	307
C.—POISONS.			
Alcoholismus.....	12	19.63	27
Ebriositas.....	5	8.18	16
Total.....	17	27.82	43

invalided, and dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.01	.01	3.5	2	3.27							
.23	.37	5.25	16	26.18							
.02	.03	3	3	4.90							
.25	.40	3.35	27	44.18							1
.19	.31	70			1	1.63					
.02	.03	4.5	2	3.27							
.07	.11	5.2	3	4.90	1	1.63					1
.01	.01	4	1	1.63							
.31	.50	16.28	5	8.18	2	3.27					
.07	.11	6.75	2	3.27	2	3.27					
.17	.27	4.64	14	22.91							
.03	.04	14	1	1.63							
.01	.01	3.5	2	3.27							
		1.5	2	3.27							
1.46	2.38	6.05	80	130.93	6	9.82					2
.20	.32	38			1	1.63			1	1.63	
.17	.27	10.83	6	9.82							
.03	.04	12	1	1.63							
.03	.04	11	1	1.63							
.35	.57	13.10	10	11.36							
.25	.40	11.62	8	13.09							
.03	.04	14	1	1.63							
.05	.08	4.75	2	3.27	2	3.27					
.22	.36	83			1	1.63					
1.37	1.80	11.88	29	47.46	4	6.54			1	1.63	
.09	.14	17.5	2	3.27							
.09	.14	34	1	1.63							
.17	.27	64			1	1.63					
.13	.21	25	2	3.27							
.50	.81	30.5	5	8.18	1	1.63					
.35	.57	5.90	22	36.00							
		1			1	1.63					
.15	.24	19.33	3	4.90							
.55	.90	6.73	30	49.09							
.01	.01	3.5	2	3.27							
.21	.34	11.28	7	11.45							
.30	.49	15.85	7	11.45							
		3	1	1.63							
1.61	2.63	8.09	72	117.83	1	1.63					
.84	1.37	25.65	11	18.00	1	1.63					
.07	.11	2.25	12	19.63							
.04	.06	3.2	5	8.18							
.11	.18	2.52	17	27.82							

TABLE II.—*Showing the number of cases, the discharged,*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio.....	4	6.54	14
Ambustio.....	4	6.54	40
Concussio cerebri.....	1	1.63	9
Contusio.....	58	94.92	450
Fractura.....	7	11.45	307
Luxatio.....	2	3.27	45
Stremma.....	26	42.55	147
Vulnus contusum.....	21	34.36	175
Vulnus incisum.....	10	16.36	68
Vulnus laceratum.....	7	11.45	132
Vulnus punctum.....	5	8.18	45
Total.....	145	237.31	1,432
Grand total.....	687	1,124.38	6,806

invalided, and dead, for each disease, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.03	.04	3.5	4	6.54	.....	.....	.....	.....	.....	.....	.....
.10	.16	10	4	6.54	.....	.....	.....	.....	.....	.....	.....
.02	.03	9	1	1.63	.....	.....	.....	.....	.....	.....	.....
1.23	2.01	7.75	57	93.28	.....	.....	.....	.....	.....	.....	1
.84	1.37	43.85	4	6.54	3	4.90	.....	.....	.....	.....	.....
.12	.19	22.5	2	3.27	.....	.....	.....	.....	.....	.....	.....
.40	.65	5.65	26	42.55	.....	.....	.....	.....	.....	.....	.....
.47	.76	8.33	20	32.73	1	1.63	.....	.....	.....	.....	.....
.18	.29	6.8	10	16.36	.....	.....	.....	.....	.....	.....	.....
.36	.58	18.85	7	11.45	.....	.....	.....	.....	.....	.....	.....
.12	.19	9	5	8.18	.....	.....	.....	.....	.....	.....	.....
3.92	6.41	9.87	140	229.13	4	6.54	.....	.....	.....	.....	1
18.64	30.50	9.90	632	1,034.37	46	75.28	.....	.....	4	6.54	5

TABLE III—Showing the number of cases, the invalided, and dead, &c.—Continued.

Vessels or stations.....	Brooklyn.				Marion.				Shenandoah.			
		Invalid- ed.				Invalid- ed.				Invalid- ed.		
Diseases and injuries.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.
B.—LOCAL DISEASES—Cont'd.												
I.—DISEASES OF THE NERVOUS SYSTEM—Continued.												
Neuralgia	8				2							
Paralysis					1	1						
Pleurodynia									1			
Sciatica.....	2											
Vertigo	2											
Total	20	3			10	4			2			
Ratio per thousand	59.70	8.95			53.46	21.39			22.47			
Number of sick days	296				458				4			
Average number sick daily.....	.81				1.29				.02			
Av. number sick daily per thousand...	2.41				6.89				.22			
Average duration of treatment	14.8				45.8				2.0			
II.—DISEASES OF THE EYE.												
Conjunctivitis	3											
Hordeolum					1							
Iritis	1											
Total	4				1							
Ratio per thousand	11.94				5.34							
Number of sick days	44				9							
Average number sick daily.....	.12				.02							
Av. number sick daily per thousand...	.35				.10							
Average duration of treatment	11.0				9.0							
III.—DISEASES OF THE CIRCULATORY SYSTEM.												
Palpitatio.....	1				2				3			
Pericarditis.....									1	1		
Syncope	1											
Total	2				2				4	1		
Ratio per thousand	5.97				10.69				44.95	11.23		
Number of sick days.....	7				14				60			
Average number sick daily.....	.01				.03				.41			
Av. number sick daily per thousand...	.02				.16				4.60			
Average duration of treatment	3.5				7.0				15			

TABLE III.—Showing the number of cases, the invalided, and dead, &c.—Continued.

Vessels or stations.....	Brooklyn.				Marion.				Shenandoah.			
Diseases and injuries.	Cases.	Invalid- ed.		Dead.	Cases.	Invalid- ed.		Dead.	Cases.	Invalid- ed.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Cont'd.												
VI.—DISEASES OF THE RESPIRATORY SYSTEM.												
Bronchitis acuta.....	3				2				5			
Bronchitis chronica.....	1	1			2	2						
Catarrhus	21				24							
Hæmoptysis					2							
Laryngitis									6			
Phthisis pneumonica acuta	1											
Phthisis pneumonica chronica.....	2	2			2	2						
Pleuritis.....					1				5	1		
Pneumonia	3			2	1				1			
Total	31	3		2	44	4			17	1		
Ratio per thousand	92.53	8.95		5.97	235.29	21.39			190.78	11.23		
Number of sick days	283				609				107			
Average number sick daily	.77				1.71				.73			
Av. number sick daily per thousand...	2.29				9.14				8.20			
Average duration of treatment	9.12				13.84				6.29			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.												
Cholera morbus.....	2											
Colica	5				5				6			
Constipatio	2								1			
Diarrhœa acuta.....	15				2				11			
Diarrhœa chronica.....					1	1						
Dyspepsia	2											
Enteritis	5	1										
Gastrodynia	1											
Hæmorrhoids	1				3	1			3	1		
Hernia	2	1							2	1		
Pharyngitis.....	14											
Rhagades ani									1			
Stomatitis	2											
Vermes	2											
Total	53	2			11	2			24	2		
Ratio per thousand	158.21	5.97			57.75	10.69			269.66	22.47		
Number of sick days	218				212				103			
Average number sick daily	.59				.59				.70			
Av. number sick daily per thousand...	1.76				3.15				7.86			
Average duration of treatment.....	4.11				19.18				4.29			

TABLE III.—Showing the number of cases, the invalided, and dead, &c.—Continued.

Vessels or stations.....	Brooklyn.			Marion.			Shenandoah.		
Diseases and injuries.	Cases.	Invalid- ed.		Cases.	Invalid- ed.		Cases.	Invalid- ed.	
		To hospital.	From service.		To hospital.	From service.		To hospital.	From service.
			Dead.			Dead.			Dead.
B.—LOCAL DISEASES—Cont'd.									
X.—DISEASES OF THE INTEGUMEN- TARY SYSTEM—Continued.									
Paronychia	4	.....	.....	1	.....	.....	2	.....	.....
Ulcer	5	.....	.....	1	.....	.....	1	.....	.....
Urticaria .....		.....	.....		.....	.....	1	.....	.....
Total	48	.....	.....	15	.....	.....	10	1	.....
Ratio per thousand	134.32	.....	.....	80.21	.....	.....	112.35	11.23	.....
Number of sick days	350	.....	.....	151	.....	.....	90	.....	.....
Average number sick daily	.95	.....	.....	.41	.....	.....	.61	.....	.....
Av. number sick daily per thousand...	2.83	.....	.....	2.19	.....	.....	6.85	.....	.....
Average duration of treatment.....	7.29	.....	.....	10.06	.....	.....	9.0	.....	.....
XI.—DISEASES OF THE ABSORBENT SYSTEM.									
Adenitis.....	7	.....	.....	4	1	.....	1	.....	.....
Ratio per thousand	20.59	.....	.....	21.39	5.34	.....	11.23	.....	.....
Number of sick days	185	.....	.....	121	.....	.....	1	.....	.....
Average number sick daily	.50	.....	.....	.34	.....	.....	.....	.....	.....
Av. number sick daily per thousand...	1.49	.....	.....	1.81	.....	.....	.....	.....	.....
Average duration of treatment.....	26.42	.....	.....	30.27	.....	.....	1	.....	.....
C.—POISONS.									
Alcoholismus	9	.....	.....		.....	.....	3	.....	.....
Ebriositas .....		.....	.....	5	.....	.....	.....	.....	.....
Total	9	.....	.....	5	.....	.....	3	.....	.....
Ratio per thousand	26.86	.....	.....	26.73	.....	.....	33.71	.....	.....
Number of sick days	18	.....	.....	16	.....	.....	9	.....	.....
Average number sick daily	.04	.....	.....	.04	.....	.....	.06	.....	.....
Av. number sick daily per thousand...	.11	.....	.....	.21	.....	.....	.67	.....	.....
Average duration of treatment.....	2	.....	.....	3.2	.....	.....	3	.....	.....
D.—VIOLENT DISEASES AND DEATHS.									
Abrasio	2	.....	.....	1	.....	.....	1	.....	.....
Ambustio .....		.....	.....	2	.....	.....	2	.....	.....
Concussio cerebri.....		.....	.....	1	.....	.....	.....	.....	.....
Contusio	32	.....	.....	10	.....	.....	16	.....	.....

TABLE III.—Showing the number of cases, the invalided, and dead, &c.—Continued.

Vessels or stations	Brooklyn.				Marion.				Shenandoah.			
Diseases and injuries.	Cases.	Invalid- ed.		Dead.	Cases.	Invalid- ed.		Dead.	Cases.	Invalid- ed.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS—Continued.												
Fractura.....	4				1	1			2	2		
Luxatio.....					2							
Stemma.....	18				3				5			
Vulnus contusum.....	6				9	1			6			
Vulnus incisum.....	6				3				1			
Vulnus laceratum.....	4				3							
Vulnus punctum.....	4				1							
Total.....	76				36	2			33	2		
Ratio per thousand	226.86				192.51	10.69			370.78	22.47		
Number of sick days.....	670				273				489			
Average number sick daily.....	1.83				.76				3.34			
Av. number sick daily per thousand...	5.46				4.06				37.52			
Average duration of treatment.....	8.81				7.58				14.81			
Grand total.....	344	18		4	191	17			152	11		
Ratio per thousand	1,026.86	53.73		11.94	1,021.83	90.90			1,707.86	123.59		
Number of sick days	3,065				2,453				1,288			
Average number sick daily.....	8.39				6.91				8.82			
Av. number sick daily per thousand...	25.04				36.95				99.10			
Average duration of treatment.....	8.91				12.84				8.47			

TABLE IV.—Showing the number of cases, the invalided

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 271.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febricula	7	25.83						
Febris continua simplex	3	11.07						
Febris enterica	1	3.69						
Febris intermittens	10	36.90						
Febris remittens								
Vaccina	8	29.52						
Variola	2	7.38	2	7.38				
Varioloides	1	3.69	1	3.69				
Total	32	118.08	3	11.07				
II.—CONSTITUTIONAL DISEASES.								
Adynamia								
Anæmia								
Lumbago								
Podagra								
Rheumatismus acutus	16	59.04						
Rheumatismus chronicus	3	11.07						
Syphilis primitiva	1	3.69						
Syphilis consecutiva	2	7.38						
Total	22	81.18						
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	3	11.07						
Dementia								
Insolatio	1	3.69						
Meningitis								
Nausea marina	2	7.38						
Neuralgia	3	11.07						
Paralysis	1	3.69	1	3.69				
Pleurodynia								
Vertigo	1							
Total	11	40.59	1	3.69				
II.—DISEASES OF THE EYE.								
Conjunctivitis	1	3.69						
Hordeolum								
Iritis								
Total	1	3.69						
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Palpitatio	4	14.76						
Pericarditis	1	3.69	1	3.69				
Syncope								
Total	5	18.45	1	3.69				

and the dead, in decennial periods, with the ratios per thousand.

BETWEEN 25 AND 35 YEARS. (Mean force, 219.)								BETWEEN 35 AND 45 YEARS. (Mean force, 80.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
4	18.26							2	25						
9	41.09							1	12.5						
5	22.83							5	62.5						
13	59.36							1	12.5						
5	22.83														
3	13.69	3	13.69												
39	178.08	3	13.69					9	112.5						
1	4.56							1	12.5	1	12.5				
3	13.69							1	12.5						
24	109.58							8	99.99	1	12.5				
5	22.83							4	50	1	12.5				
1	4.56														
4	18.26														
38	173.52							14	175	3	37.5				
1	4.56														
5	22.83	4	18.26												
1	4.56														
2	9.13	2	9.13												
5	22.83							1	12.5						
								1	12.5						
								1	12.5						
14	63.92	6	27.85					3	37.5						
1	4.56														
1	4.56														
2	9.13														
								2	25.0						
1	4.56														
1	4.56							2	25.0						

TABLE IV.—Showing the number of cases, the invalided, and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 271.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	3	11.07						
Bronchitis chronica	1	3.69	1	3.69				
Catarrhus	25	92.21						
Hæmoptysis	1	3.69						
Laryngitis	2	7.38						
Phthisis pneumonica acuta								
Phthisis pneumonica chronica	2	7.38	2	7.38				
Pleuritis	2	7.38						
Pneumonia	1	3.69						
Total	37	136.53	3	11.07				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica	4	14.76						
Constipatio	1	3.69						
Diarrhœa acuta	12	44.24						
Diarrhœa chronica								
Dyspepsia	1	3.69						
Enteritis								
Gastrodynia								
Hæmorrhoids	2	7.38	1	3.69				
Hernia								
Pharyngitis	10	36.90						
Rhagades ani								
Stomatitis								
Vermes								
Total	30	110.70	1					
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria	1	3.69	1	3.69				
Chancroides	2	7.38						
Cystitis								
Dysuria								
Gonorrhœa	8	29.52						
Orchitis	6	22.14						
Paraphymosis								
Urethrae strictura	1	3.69	1	3.69				
Varicocele								
Total	18	66.42	2	7.38				
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis	2	7.38						
Ankylosis	1	3.69						
Ostitis	1	3.69	1	3.69				
Synovitis								
Total	4	14.76	1	3.69				

in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 219.)								BETWEEN 35 AND 45 YEARS. (Mean force, 80.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
2	9.13							1	12.5						
2	9.13	2	9.13					5	62.5						
20	91.32							1	12.5						
3	13.69							1	12.5						
1	4.56														
1	4.56	1	4.56					1	12.5	1	12.5				
3	13.69	1	4.56					1	12.5						
2	9.13														
34	155.25	4	18.26					10	125	1	12.5				
1	4.56							3	37.5						
6	27.85							1	12.5						
12	54.79							2	25.0						
1	4.56							1	12.5	1	12.5				
5	22.83	1	4.56					5	62.5	1	12.5				
3	13.69	1	4.56					1	12.5	1	12.5				
2	9.13							1	12.5						
1	4.56														
2	9.13														
1	4.56														
34	155.25	2	9.13					15	187.5	3	37.5				
4	18.26														
1	4.56														
1	4.56														
1	4.56														
2	9.13														
1	4.56	1	4.56					1	12.6						
1	4.56	1	4.56					2	25.0						
11	50.22	2	9.13					3	37.5						
								2	25.						
								2	25.						

TABLE IV.—Showing the number of cases, the invalided, and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 271.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	11	40.59						
Acne.....	1	3.69	1	3.69				
Cellulitis.....	2	7.38						
Furunculus.....	16	59.04						
Impetigo.....	2	7.38						
Paronychia.....	4	14.76						
Ulcus.....	3	11.07						
Urticaria.....	1	3.69						
Total.....	40	147.60	1	3.69				
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	7	25.83						
C.—POISONS.								
Alcoholismus.....	2	7.38						
Ebriositas.....								
Total.....	2	7.38						
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....	1	3.69						
Ambustio.....	2	7.38						
Concussio cerebri.....	1	3.69						
Contusio.....	18	66.42						
Fractura.....	4	14.76	2	7.38				
Luxatio.....								
Stemma.....	8	29.52						
Vulnus contusum.....	7	25.83	1	3.69				
Vulnus incisum.....	4	14.76						
Vulnus laceratum.....	5	18.45						
Vulnus punctum.....	3	11.07						
Total.....	53	195.57	3	11.07				
Grand aggregate.....	262	966.78	16	59.04				

in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 219.)								BETWEEN 35 AND 45 YEARS. (Mean force, 80.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
10	45.66	.....	.....	.....	.....	.....	.....	1	12.5	.....	.....	.....	.....	.....	.....
9	41.09	.....	.....	.....	.....	.....	.....	1	12.5	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	2	25.	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	114.14	.....	.....	.....	.....	.....	.....	4	50.	.....	.....	.....	.....	.....	.....
4	18.26	1	4.56	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	6	75.	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	3	37.5	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	9	112.5	.....	.....	.....	.....	.....	.....
3	13.69	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	9.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	123.27	.....	.....	.....	.....	.....	.....	7	87.5	.....	.....	.....	.....	.....	.....
3	13.69	1	4.56	.....	.....	.....	.....	1	12.5	.....	.....	.....	.....	.....	.....
1	4.56	.....	.....	.....	.....	.....	.....	4	50.	.....	.....	.....	.....	.....	.....
14	63.92	.....	.....	.....	.....	.....	.....	4	50.	.....	.....	.....	.....	.....	.....
9	41.09	.....	.....	.....	.....	.....	.....	1	12.5	.....	.....	.....	.....	.....	.....
5	22.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	9.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	9.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
68	310.50	1	4.56	.....	.....	.....	.....	17	212.5	.....	.....	.....	.....	.....	.....
273	1,246.57	19	86.76	.....	.....	.....	.....	88	1,100.	7	87.5	.....	.....	.....	.....

TABLE IV.—Showing the number of cases, the invalided, and the dead

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 36.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febricula								
Febris continua simplex	1	27.77						
Febris enterica								
Febris intermittens	4	10.11	1	27.77				
Febris remittens								
Vaccina								
Variola								
Varioloides								
Total	5	138.88	1	27.77				
II.—CONSTITUTIONAL DISEASES.								
Adynamia	1	27.77	1	27.77				
Anæmia								
Lumbago								
Podagra	1	27.77						
Rheumatismus acutus	7	194.44	1	27.77				
Rheumatismus chronicus	4	111.11						
Senectus								
Syphilis primitiva								
Syphilis consecutiva								
Total	13	361.11	2	55.55				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Apoplexia								
Cephalalgia								
Dementia								
Insolatio								
Meningitis								
Nausea marina								
Neuralgia	1	27.77						
Paralysis								
Pleurodynia								
Sciatica	2	55.55						
Vertigo								
Total	3	83.33						
II.—DISEASES OF THE EYE.								
Conjunctivitis	1	27.77						
Hordeolum								
Iritis								
Total	1	27.77						
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Palpitatio								
Pericarditis								
Syncope								
Total								

in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 5.)								TOTALS. (Mean force, 611.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
.....								4	6.54	.....	.....	.....	.....	.....	.....
.....								18	29.45	.....	.....	.....	.....	.....	.....
.....								10	16.36	.....	.....	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								32	52.37	1	1.63	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								13	21.27	.....	.....	.....	.....	.....	.....
.....								5	8.18	5	8.18	.....	.....	.....	.....
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								85	139.11	7	11.45	.....	.....	.....	.....
.....															
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								5	8.18	.....	.....	.....	.....	.....	.....
.....								55	90.01	2	3.27	.....	.....	.....	.....
2	400	.....	.....	.....	.....	.....	.....	18	29.45	1	1.63	.....	.....	.....	.....
1	200	1	200	.....	.....	.....	.....	1	1.63	1	1.63	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								6	9.8	.....	.....	.....	.....	.....	.....
.....															
3	600	1	200	.....	.....	.....	.....	90	147.29	6	9.82	.....	.....	.....	.....
.....															
.....															
1	200	.....	.....	.....	.....	1	200	1	1.63	.....	.....	.....	.....	1	1.63
.....								4	6.54	.....	.....	.....	.....	.....	.....
.....								5	8.18	4	6.54	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								2	3.27	2	3.27	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								10	16.36	.....	.....	.....	.....	.....	.....
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
1	200	.....	.....	.....	.....	1	200	32	52.37	7	11.45	.....	.....	1	1.63
.....															
.....															
1	200	.....	.....	.....	.....	.....	.....	3	4.90	.....	.....	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
1	200	.....	.....	.....	.....	.....	.....	5	8.18	.....	.....	.....	.....	.....	.....
.....															
.....								6	9.82	.....	.....	.....	.....	.....	.....
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								8	13.09	1	1.63	.....	.....	.....	.....

TABLE IV.—Showing the number of cases, the invalided, and the dead,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 36.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	4	111.11						
Bronchitis chronica								
Catarrhus	5	138.88						
Hæmoptysis								
Laryngitis								
Phthisis pneumonica acuta								
Phthisis pneumonica chronica								
Pleuritis								
Pneumonia	1	27.77					1	27.77
Total	10	277.77					1	27.77
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica	3	83.33						
Constipatio	1	27.77						
Diarrhœa acuta	2	55.55						
Diarrhœa chronica								
Dyspepsia								
Enteritis								
Gastrodynia								
Hæmorrhœis								
Hernia								
Pharyngitis	1	27.77						
Rhagades ani								
Stomatitis								
Vermes	1	27.77						
Total	8	222.22						
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria								
Chancroides								
Cystitis								
Dysuria								
Gonorrhœa	1	27.77						
Orchitis								
Paraphymosis								
Urethræ strictura								
Varicocele								
Total	1	27.77						
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis								
Ankylosis								
Ostitis								
Synovitis								
Total								

in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 5.)								TOTALS. (Mean force, 611.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
								10	16.36						
								3	4.90	3	4.90				
								55	90.01						
								2	3.27						
								6	9.82						
								1	1.63						
								4	6.54	4	6.54				
								6	9.82	1	1.63				
1	200.0					1	200	5	8.18					2	
1	200.0					1	200	92	150.57	8	13.09			2	3.27
1	200.0							2	3.27						
								16	26.18						
								3	4.90						
								28	45.82						
								1	1.63	1	1.63				
								2	3.27						
								5	8.18	1	1.63				
								1	1.63						
								7	11.45	2	3.27				
								4	6.54	2	3.27				
								14	22.91						
								1	1.63						
								2	3.27						
								2	3.27						
1	200.0							88	144.02	6	9.82				
1	200.0					1	200	2	3.27	1	1.63			1	1.63
								6	9.82						
								1	1.63						
								1	1.63						
								10	16.36						
								8	13.09						
								1	1.63						
								4	6.54	2	3.27				
								1	1.63	1	1.63				
1	200.0					1	200	34	55.64	4	6.54			1	1.63
								2	3.27						
								1	1.63						
								1	1.63	1	1.63				
								2							
								6	9.82	1	1.63				

TABLE IV.—Showing the number of cases, the invalided, and the dead,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 36.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....								
Acne.....								
Cellulitis.....								
Furunculus.....	3	83.33						
Impetigo.....								
Paronychia.....								
Ulcus.....	1	27.77						
Urticaria.....								
Total.....	4	111.11						
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	1	27.77						
C.—POISONS.								
Alcoholismus.....	1	27.77						
Ebriositas.....	2	55.55						
Total.....	3	83.33						
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....								
Ambustio.....								
Concussio cerebri.....								
Contusio.....	6	166.66						
Fractura.....								
Luxatio.....								
Stemma.....								
Vulnus contusum.....	1	27.77						
Vulnus incisum.....								
Vulnus laceratum.....								
Vulnus punctum.....								
Total.....	7	194.44						
Grand aggregate.....	56	1,472.22	3	83.33			1	27.77

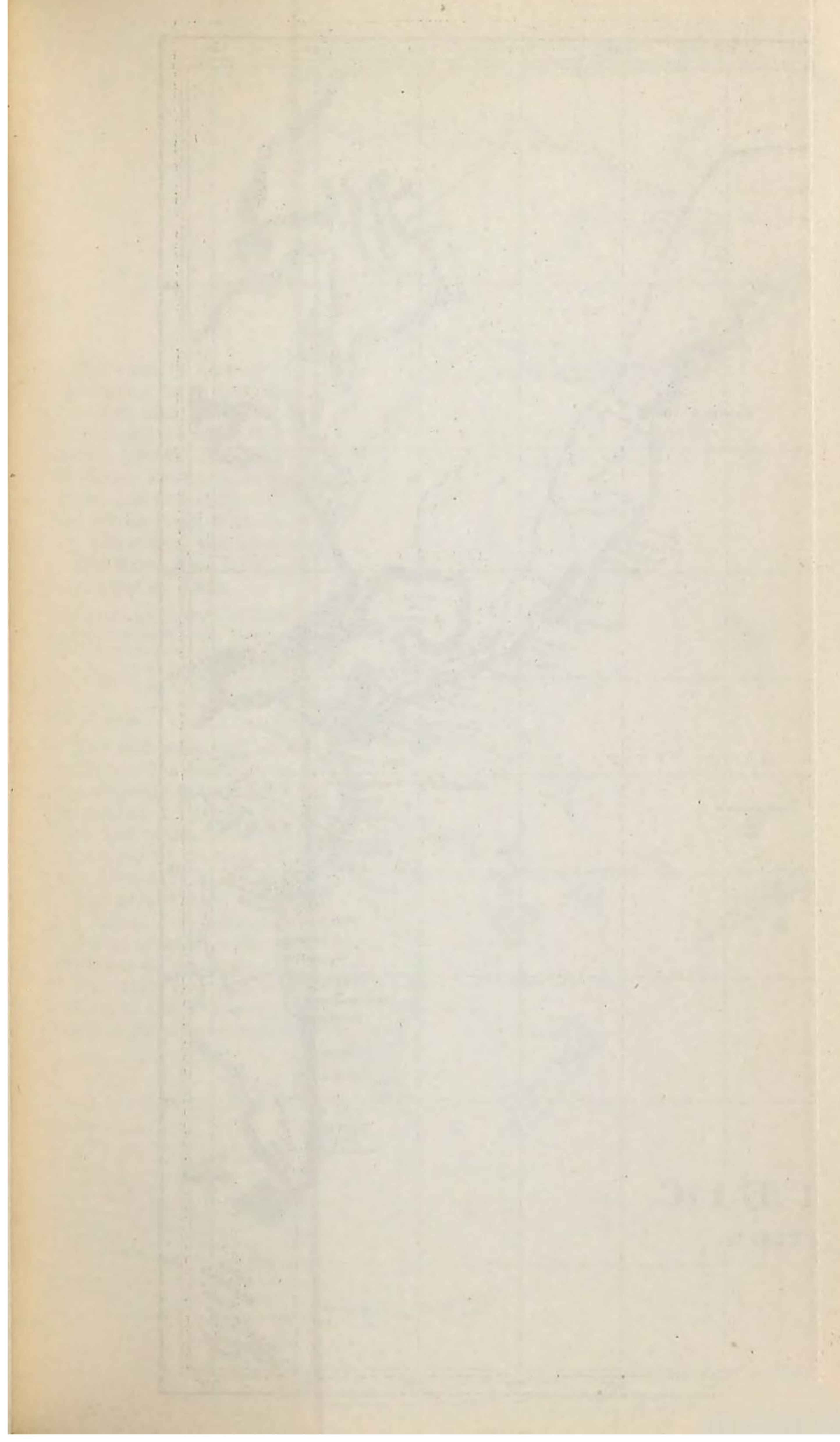
in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 5.)								TOTALS. (Mean force, 611.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv. ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From serv. ice.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
.....								22	36.	.....	.....	.....	.....	.....	.....
.....								1	1.63	1	1.63	.....	.....	.....	.....
.....								3	4.90	.....	.....	.....	.....	.....	.....
.....								30	49.09	.....	.....	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								7	11.45	.....	.....	.....	.....	.....	.....
.....								7	11.45	.....	.....	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								73	119.47	1	1.63	.....	.....	.....	.....
.....															
.....								12	19.63	1	1.63	.....	.....	.....	.....
.....															
.....								12	19.63	.....	.....	.....	.....	.....	.....
.....								5	8.18	.....	.....	.....	.....	.....	.....
.....								17	27.82	.....	.....	.....	.....	.....	.....
.....															
.....								4	6.54	.....	.....	.....	.....	.....	.....
.....								4	6.54	.....	.....	.....	.....	.....	.....
.....								1	1.63	.....	.....	.....	.....	.....	.....
.....								58	94.92	.....	.....	.....	.....	.....	.....
.....								7	11.45	3	4.90	.....	.....	.....	.....
.....								2	3.27	.....	.....	.....	.....	.....	.....
.....								26	42.55	.....	.....	.....	.....	.....	.....
.....								21	34.36	1	1.63	.....	.....	.....	.....
.....								10	16.36	.....	.....	.....	.....	.....	.....
.....								7	11.45	.....	.....	.....	.....	.....	.....
.....								5	8.18	.....	.....	.....	.....	.....	.....
.....								145	237.31	4	6.54	.....	.....	.....	.....
8		1	200	1,600	.....	3	600	687	1,124.38	46	75.28	.....	.....	.....	.....

SANITARY CONDITION
OF THE
PACIFIC STATION.

STATION OFFICE

STATION OFFICE





PACIFIC SQUADRON.

The vessels employed within the wide limits of the Pacific Station, embracing as it does the whole of the western coast of North and South America and the Pacific islands, consisted of 13 vessels, as follows: Pensacola, 2d rate, flag-ship; Hartford, Alaska, and Lackawanna, 3d rates; Adams, Essex, Iroquois, Ranger, Wachusett, and Independence, 3d rates; Onward, 4th rate and storeship; Hassler and McArthur, 4th rates, and Coast Survey vessels. All the vessels were employed during the whole year, with the exception of the Hartford, whose service was 184 days, and the Iroquois, 264 days.

The force was 2,242, or corrected on time 2,021, an increase of 316 over that of 1881.

The total number of admissions, including those remaining from the previous year, was.....	2,021 = 1,000 $\frac{0}{100}$
Discharged, recovered	1,776 = 878.77 $\frac{0}{100}$
Invalided $\left\{ \begin{array}{l} \text{to hospital} \\ \text{from service} \end{array} \right.$	181 = 89.55 $\frac{0}{100}$
Died.....	11 = 5.44 $\frac{0}{100}$
Continued	8 = 3.95 $\frac{0}{100}$
	45

The sick rate will be seen, upon comparison with that of last year, to be somewhat smaller, to the extent of .17 $\frac{0}{100}$, while the invaliding rate was slightly increased, as was the death rate. The total loss of service amounted to 18,360 days, an increase of over 300 days, as compared with last year. The daily average number of sick was, absolute, 50.30, or a ratio of 24.88 $\frac{0}{100}$ of force, and the average duration of treatment was 9.08 days.

The report from the British squadron on this station gives the following ratios: Admissions, — $\frac{0}{100}$; invaliding, — $\frac{0}{100}$; death, — $\frac{0}{100}$. In the German squadron the ratio of admissions was 743.6 $\frac{0}{100}$, and the average duration of treatment 33.9 days.

The daily average sick rates of the various ships of the squadron are shown in the following table, the figures indicating the ratio per thousand of force as compared with preceding years:

Ships.	1879.	1880.	1881.	1882.
Hartford				57.60
Iroquois				36.69
Essex				30.55
Onward	35.60		35.40	28.91
Wachusett			44.04	27.79
Lackawanna	35.44		26.86	27.51
Ranger			18.15	27.38
Alaska	34.24		16.71	26.76
Pensacola	38.39		25.86	22.20
Independence	20.83		14.44	21.55
Adams	27.26		33.26	19.32
Hassler	19.58		23.33	7.00
McArthur			9.31	.93

The daily average loss of service, as distributed among the various classes of disease, is exhibited in the following table, together with the ratio per thousand for the three preceding years:

Diseases.	1879.	1880.	1881.	1882.
GENERAL DISEASES:				
Zymotic	4.79	1.18	2.22	1.92
Constitutional	12.66	6.14	4.80	5.10
LOCAL DISEASES:				
Diseases of the nervous system	3.97	1.18	1.40	1.38
Diseases of the eye	.72	1.02	.42	.39
Diseases of the ear	.12	.09	.15	.06
Diseases of the teeth	.02	.01	.01	.01
Diseases of the circulatory system	.17	.52	.17	.62
Diseases of the respiratory system	3.80	3.45	3.14	2.80
Diseases of the digestive system	4.17	2.24	2.35	1.99
Diseases of the genito-urinary system	3.83	2.27	2.90	2.31
Diseases of the locomotive system	.24	.07	.10	.03
Diseases of the integumentary system	.18	2.68	1.64	2.26
Diseases of the absorbent system	.27	.75	1.08	1.31
Non-malignant tumors and cysts	.25	.01	.26	.02
POISONS	.40	.18	.32	.13
VIOLENT DISEASES	7.32	4.84	4.41	4.48
FEIGNED DISEASES				.01

The invaliding to hospital occurred in the following classes and ratios per thousand, which are also given for the three preceding years:

Diseases.	1879.	1880.	1881.	1882.
GENERAL DISEASES:				
Zymotic	7.32	6.05	2.34	7.91
Constitutional				
LOCAL DISEASES:				
Diseases of the nervous system	19.33	21.80	21.70	17.31
Diseases of the eye	15.31	6.05	7.03	7.91
Diseases of the ear	3.32	.60	3.51	3.95
Diseases of the circulatory system	1.33	1.81	1.17	.49
Diseases of the respiratory system	.66	3.63	1.17	6.43
Diseases of the digestive system	15.31	13.32	14.07	12.86
Diseases of the genito-urinary system	7.99	7.21	9.38	7.42
Diseases of the integumentary system	3.98	4.84	4.69	3.95
Diseases of the absorbent system		1.22		10.39
Diseases of the absorbent system	1.33		4.10	3.95
VIOLENT DISEASES	7.99	9.01	5.27	6.92

The following classes contributed the cases invalided from the service and the ratios per thousand:

Zymotic diseases	1 = .49
Constitutional diseases	4 = 1.97
Diseases of the nervous system	1 = .49
Diseases of the respiratory system	2 = .98
Diseases of the digestive system	1 = .49
Diseases of the genito-urinary system	1 = .49
Diseases of the integumentary system	1 = .49

The invaliding was distributed among the ships in the following ratios, which are compared with preceding years:

Ships.	1880.		1881.		1882.	
	To hospital.	From service.	To hospital.	From service.	To hospital.	From service.
Alaska	6.66	1.21	61.77		73.21	4.31
Adams	6.66		129.88	22.59	152.54	11.29
Essex					76.50	
Hartford					59.88	
Hassler	32.10			23.80	75.00	
Independence	3.63	.60	222.24	44.44	251.85	37.03
Iroquois					146.78	
Lackawanna	9.08		79.43		36.19	
McArthur			34.48		93.75	
Onward	2.42		135.13	27.02	54.05	27.02
Pensacola	30.39	1.81	37.55		20.51	
Ranger	1.21		106.38		123.06	7.69
Wachusett	3.63	.60	54.62	10.92	136.90	5.95

The deaths originated from diseases falling under the following groups:

Diseases.	Number.	Per thousand.
Zymotic	1	.49
Diseases of the nervous system	1	.49
Diseases of the respiratory system	3	1.48
Diseases of the digestive system	1	.49
Violence	2	.98

GENERAL DISEASES.

ZYMOTIC GROUP.

The total number of cases returned under this group was 251, mostly of intermittent and remittent fevers, of which there were 150 and 34 cases respectively. There were also 22 of febris continua simplex, and 17 of vaccina. The ratio of admissions for these diseases was $124.19\frac{0}{0}$, and the daily average sick rate $1.92\frac{0}{0}$. The total loss of service was 1,387 days, and the average duration of treatment 5.52 days; of the whole number, 230 were discharged cured, 16 were invalided to hospital, with a ratio of $7.91\frac{0}{0}$, and 1 from the service, or $.49\frac{0}{0}$. The death ratio from a single case was $.49\frac{0}{0}$, and 3 were continued.

In the English squadron the ratios were: Admissions,— $\frac{0}{0}$; invaliding,— $\frac{0}{0}$; death,— $\frac{0}{0}$. In the German squadron the admission ratio for the zymotic and constitutional diseases was $200.9\frac{0}{0}$, and the average duration of treatment 9.8 days.

The following table indicates the ratios per thousand of the zymotic cases, as they occurred on the several ships, in comparison with those of three preceding years:

Ships.	1879.	1880.	1881.	1882.
Ranger		7.40	234.04	430.76
Iroquois				192.66
Adams	110.46	115.76	79.09	186.44
Onward	170.73	161.29	189.18	162.16
Lackawanna	215.68	129.80	154.20	153.84
Alaska	87.71	153.84	142.85	112.06
McArthur			34.48	93.75
Independence	297.61	78.12	66.66	88.88
Hartford				77.84
Hassler		170.73	71.42	75.00
Essex				71.03
Pensacola	168.42	138.38	115.02	56.41
Wachusett		40.00	49.18	53.57

Erysipelas.—Three cases of this disease were returned, a ratio of $1.48\frac{0}{0}$, and causing the loss of 14 days. All were returned to duty after the brief period of 4.66 days. They occurred on the Alaska, Lackawanna, and Ranger.

Febricula.—There were 16 cases of this affection, contributing a ratio of $7.91\frac{0}{0}$, and a loss of 52 days' service. The daily average ratio of sick was $.06\frac{0}{0}$, and the period of treatment 3.25 days.

Febris continua simplex.—The returns included 22 cases of simple continued fever, with a ratio of $10.88\frac{0}{0}$, and a loss of 134 days. Two of the number were invalided to hospital, a ratio of $.98\frac{0}{0}$. The ratio of sick daily from this disease was $.17\frac{0}{0}$, and the average period of treatment 6.09 days.

Febris enterica.—There were reported 5 cases of typhoid fever, a ratio of $2.47\frac{0}{0}$. Two occurred on the Alaska, both of which were invalided; 1 on the Pensacola, which died; and 1 each on the Iroquois and Wachusett, the latter being invalided. The loss of service was 116 days, the average number sick daily $.15\frac{0}{0}$, and the average duration of treatment 23.20. Three were invalided, ratio $1.48\frac{0}{0}$; 1 died, and 1 was continued.

Febris intermittens.—There were admitted 150 cases of this disease, the ratio being $74.22\frac{0}{0}$. The largest number occurred on the Ranger, 38; and there were 33 on the Lackawanna, 16 each on the Adams and Pensacola, 10 on the Alaska, and 9 each on the Iroquois and Hartford. The number of sick days amounted to 621, an average of 4.14 for each case. The daily average sick rate was $.84\frac{0}{0}$. Single cases were invalided to hospital, from the service, and continued.

Febris remittens.—The reports contained 34 entries for this disease, a ratio of $16.82\frac{0}{0}$ as against $11.14\frac{0}{0}$ last year. The loss of service was 290 days, an average of 8.52 for each case, and the daily average ratio of sick was $.39\frac{0}{0}$. Six were invalided to hospital, or $2.96\frac{0}{0}$, and 1 was continued. They occurred chiefly on the Ranger and Adams.

Morbilli.—Measles occurred in isolated cases on 4 ships; the Adams, Hassler, Independence, and Hartford. They were all promptly invalided.

Vaccina.—Vaccination was followed by sickness requiring a relief from duty in 17 cases, and the loss of service was 156 days. Eleven occurred on the Alaska, 4 on the Adams, and 2 on the Iroquois.

The following table of vaccinations in this squadron is presented:

Vessels.	Presenting good cicatrices.		No evidence of previous vaccination.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Adams	77	196	10	0	0	0	283
Alaska	23	20	6	2	1	0	52
Essex	47	120	0	0	0	0	167
Hartford	12	179	1	13	0	16	221
Independence	40	306	9	34	0	31	420
Iroquois	24	71	3	10	0	6	114
McArthur	0	13	0	6	0	5	24
Ranger	0	11	1	0	0	0	12
Total	223	916	30	65	1	58	1,293
Per cent. of all cases	88.0		7.3		4.5		
Per cent. of successful	19.5		3.1		1.7		19.6

CONSTITUTIONAL DISEASES.

The number of cases falling within this class was 297, contributing a ratio of $146.95\frac{0}{0}$, a slight diminution from that of last year, which was $151.31\frac{0}{0}$, showing a progressive reduction for three years. The time lost was 3,767 days, and the average duration of treatment 12.68 days. There were invalided to hospital 35, with a ratio of $17.31\frac{0}{0}$, and from the service 4, or $1.97\frac{0}{0}$. Twelve cases were continued.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$.

The ratios of the constitutional affections, as they were returned from

the various ships, were as shown in the subjoined table, with those of the three previous years:

Ships.	1879.	1880.	1881.	1882.
Iroquois				201.83
Onward	317.07	419.35	27.02	189.18
Lackawanna	176.47	153.84	158.87	167.42
Pensacola	192.10	190.60	112.68	166.66
Wachusett		310.00	218.57	166.66
Ranger			170.21	153.84
Adams	191.86	142.10	192.09	152.54
Essex				147.54
Alaska	136.84	106.22	115.83	142.24
Hartford				113.77
Independence	59.52	54.60	222.22	74.07
Hassler	100.45	97.57	166.66	50.00

Adynamia.—The returns of this squadron indicated 26 cases of this affection, a ratio of $12.86\frac{0}{0}$ as against $20.52\frac{0}{0}$ in 1881, showing a decided diminution. The loss of service was 258 days, and the number of daily sick was $.34\frac{0}{0}$. Six cases invalided to hospital, and the remainder restored to duty after an average duration of treatment of 9.40 days. The largest numbers occurred on the Ranger and Iroquois, corresponding to the prevalence of intermittent fever.

Anæmia.—The Essex reported a single case, which recovered after 9 days of treatment.

Diabetes.—Two cases were returned from the Alaska, which were each 60.80 days under treatment; 1 was discharged to duty, and the other continued.

Lumbago.—Seven cases were recorded, a ratio of $3.46\frac{0}{0}$, and all recovered on board. The loss of service was 65 days, and the daily average number sick $.08\frac{0}{0}$.

Rheumatismus.—There were reported 43 cases of acute rheumatism and 51 of the chronic variety, giving respectively a ratio of $21.27\frac{0}{0}$ and $25.23\frac{0}{0}$, a diminution in the former, and a slight increase in the latter. The loss of service amounted to 463 days for the acute disease, and 301 for the chronic, making the duration of treatment 10.76 and 5.90 days respectively. Four cases of the former ($1.97\frac{0}{0}$) and 2 of the latter were invalided to hospital.

Scrofula.—The Hartford and Iroquois each reported 1 case, the average duration of which was $13.50\frac{0}{0}$ days.

Syphilis primitiva.—There were 66 cases of primary syphilis, a ratio of $32.65\frac{0}{0}$; a slight diminution from that of last year, $34.01\frac{0}{0}$. The daily ratio of sick from this affection was $1.51\frac{0}{0}$, and the loss of service was 1,122 days. Three cases ($1.48\frac{0}{0}$) were invalided to hospital, and 3 were continued. The average duration of treatment was 17 days.

Syphilis consecutiva.—A total of 95 cases were recorded of secondary syphilis, the ratio being $47.0\frac{0}{0}$ as against $38.70\frac{0}{0}$ last year. The loss of service here was 1,387 days, and the average duration of treatment 14.60 days. There were 18 invalided to hospital, or $8.90\frac{0}{0}$, and 3, or $1.48\frac{0}{0}$, from the service. Four cases continued.

LOCAL DISEASES.

DISEASES OF THE NERVOUS SYSTEM.

The admissions in this class of diseases amounted to 115, making a ratio of $56.90\frac{0}{0}$, a small reduction from that of last year, which was

60.99 $\frac{0}{0}$. The number of sick days was 1,020, and the daily average number of sick 1.38 $\frac{0}{0}$, while the average duration of treatment was 8.87 days. Of the whole number, 16, or 7.91 $\frac{0}{0}$, were invalided to hospital; 1 from the service, and there was one death from meningitis.

The following table exhibits the ratio per thousand of these diseases on the several ships, and compared with previous years:

Ships.	1879.	1880.	1881.	1882.
Hartford.....	.....	.....	.....	125.74
Wachusett.....	.....	.....	103.82	71.42
Iroquois.....	.....	100.00	.....	64.22
Alaska.....	133.34	.....	46.33	64.65
Adams.....	17.44	32.96	67.79	62.14
Ranger.....	.....	5.21	7.09	61.53
Pensacola.....	105.26	7.40	70.42	46.15
Lackawanna.....	24.50	114.85	56.07	45.24
Independence.....	107.14	28.84	33.33	44.44
McArthur.....	.....	23.43	.....	31.25

Cephalalgia.—Twenty cases of this affection were rated, contributing a ratio of 9.89 $\frac{0}{0}$, and a loss of 47 days in service. They were restored to duty after an average period of treatment of 2.35 days.

Convulsio.—A single case was invalided to hospital from the Iroquois, at Mare Island.

Dementia.—The Alaska, Iroquois, and Wachusett each recorded a case, all of which were invalided to hospital after an average period of 59 days. The loss of service, therefore, was 177 days.

Epilepsia.—There were 7 entries for this disease, a ratio of 3.46 $\frac{0}{0}$ as against 4.69 $\frac{0}{0}$ last year. The loss of service was 111 days, and the daily average number of sick was .14 $\frac{0}{0}$. Two cases .98 $\frac{0}{0}$, were invalided to hospital, and 1 from the service.

Hysteria.—One case was entered on the report of the McArthur, and invalided to hospital.

Insolatio.—Two cases of sunstroke were reported from the Iroquois, which recovered after a period of 25 days each.

Irritatio spinalis.—The Alaska reported this case, which was transferred to hospital.

Melancholia.—The Adams and Pensacola each reported a case of this malady, which were invalided after a short period to hospital.

Meningitis.—A fatal case of this disease was reported from the Pensacola, which was under treatment 5 days.

Nausea marina.—The loss of service which resulted from 6 cases of this trouble was 17 days, and the case-ratio 2.96 $\frac{0}{0}$.

Neuralgia.—A total of 44 cases were returned under this head, a ratio of 21.77 $\frac{0}{0}$ as against 31.67 $\frac{0}{0}$ last year. The loss of service was 281 days, the daily ratio of patients .37 $\frac{0}{0}$, and the average duration of treatment 6.38 days. Four cases, or 1.97 $\frac{0}{0}$, were invalided to hospital.

Paralysis.—Eight cases of this disease were included in the returns, giving a ratio of 3.95 $\frac{0}{0}$ as against 2.34 $\frac{0}{0}$ last year. The loss of time was 109 days, or 13.62 days for each case. Two were invalided to hospital.

Pleurodynia.—The ratio given by 6 cases of this trouble was 2.96 $\frac{0}{0}$, and the loss of service 29 days.

Vertigo.—There were entered 12 cases, in the ratio of 5.93 $\frac{0}{0}$, and the loss of service was 144 days. Nine cases recovered, 1 was invalided to hospital, and 2 continued.

DISEASES OF THE EYE.

Of affections of the eye, there were reported 28 cases, making a ratio of $13.85\frac{0}{0}$, as against $16.42\frac{0}{0}$ last year. The loss of time was 291 days, and the daily average number of sick $.39\frac{0}{0}$, while the average duration of treatment was 10.39 days. Of the total, 18 were restored to duty; 8, or $3.85\frac{0}{0}$, were invalided to hospital, and 2 were continued.

Asthenopia.—The single case of this affection occurred on the Lackawanna, and was only 3 days under treatment.

Conjunctivitis.—There were 14 cases, and a case ratio of $6.92\frac{0}{0}$, with a daily sick rate of $.10\frac{0}{0}$. The loss of time was 82 days, or 5.57 for each case. One was invalided to hospital.

Hemeralopia.—Two cases were recorded on the Iroquois, the subject of which was finally transferred to hospital.

Iritis.—The Alaska reported 1 case, which was under treatment for 7 days, and recovered.

Ophthalmia gonorrhoeica.—The loss of service from the single case of this affection reported from the Essex was 22 days.

Ophthalmia tarsi.—The Hartford reported a case as having been transferred to hospital after 3 days' treatment.

Retinitis.—The ratio given by 5 cases of this affection was $2.47\frac{0}{0}$, and the loss of service 138 days. One case was restored to duty; 3 were invalided to hospital, and 1 was continued.

Ulcus corneæ.—The Lackawanna and Wachusett each returned 1 case, the latter being invalided to hospital. The average duration was 16.50 days.

DISEASES OF THE EAR.

The cases recorded under this head numbered 14, and the ratio of cases was $6.92\frac{0}{0}$ as against $11.14\frac{0}{0}$ last year. The number of sick days was 49, and the average duration 2.8 days. Seven cases returned to duty, and 13 were invalided to hospital, the ratio being $6.43\frac{0}{0}$.

Otalgia.—But 4 cases of this trouble were recorded, a ratio of $1.97\frac{0}{0}$, and the loss of time was 10 days, or 2.5 for each case.

Otitis.—The same number and ratio occurred as in the last disease, the loss of service here being 14 days.

Otorrhœa.—This affection also yielded 4 cases, which returned to duty after an average period of 4.25 days.

Surditas.—Two cases of deafness were mentioned, one necessitating a transfer to hospital.

DISEASES OF THE TEETH.

Five cases were noted in this class, of which 4 were of odontalgia, and 1 of parulis. The loss of service was 14 days, and the average duration was 2.8 days.

DISEASES OF THE CIRCULATORY SYSTEM.

Twenty cases fall within this class, making a case ratio of $9.89\frac{0}{0}$, and a daily ratio of $.62\frac{0}{0}$. The number of sick days was 466, and the average duration of treatment 23.3 days. Seven cases were returned to duty, and 13, or $6.43\frac{0}{0}$, invalided to hospital.

Aneurysma.—There were 4 cases of aneurism, 2 of which occurred on the Lackawanna, and 1 on the Pensacola and Wachusett respectively; all were invalided to hospital, with an average loss of service of 50.50 days. The ratio of sick daily from these cases was $.27\frac{0}{0}$.

Angina pectoris.—The Adams and Iroquois reported the 2 cases of this affection, and both were invalided to hospital, the ratio being $.98\frac{0}{0}$.

Morbi valvularum cordis.—There were 5 cases of valvular diseases of the heart reported, a ratio of $2.47\frac{0}{0}$, and causing a loss of 70 days; of these 2 were restored to duty, and 3 invalided to hospital, the average loss of service having been 14 days.

Palpitatio.—Seven cases made up the total of admissions for this trouble, and the resulting number of sick days was 152. The ratio of admissions was $3.46\frac{0}{0}$, and of the daily sick $.20\frac{0}{0}$. Four cases recovered, and 3, with a ratio of $1.48\frac{0}{0}$, were invalided. The average duration was 21.71 days.

Phlebitis.—The Wachusett reported this case, which was not of a serious character.

Varix.—This case also was noted on the Wachusett, and was invalided to hospital.

DISEASES OF THE RESPIRATORY SYSTEM.

These affections occurred in 222 cases, and the ratio was $109.84\frac{0}{0}$, nearly that of last year, $102.05\frac{0}{0}$. The number of sick days was 2,067, and the daily average number of sick was in the ratio of $2.80\frac{0}{0}$, while the average duration of treatment was 9.31 days. The number restored to duty was 187; 26 were invalided to hospital, the ratio being $12.86\frac{0}{0}$, and 2 from the service; there were 3 deaths from pneumonia. Four cases remained under treatment.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $6.9\frac{0}{0}$, and the average duration of treatment 17.3 days.

The diseases of the respiratory organs were reported from the several ships in the following ratios per thousand, those of preceding years being also given:

Ships.	1879.	1880.	1881.	1882.
Independence.....	190.47	93.75	133.33	222.22
Hartford.....				179.64
Wachusett.....		510.00	240.43	142.84
Adams.....	40.69	26.31	67.79	129.94
Essex.....				124.59
Lackawanna.....	58.82	62.50	102.80	104.07
Pensacola.....	163.15	167.10	103.28	102.56
Alaska.....	101.75	76.92	57.91	68.53
Ranger.....		50.00	56.73	61.53
McArthur.....				31.55
Iroquois.....				27.52
Onward.....	48.78	193.54	189.18	27.02

Asthma.—Eight cases of this affection gave a ratio of $3.95\frac{0}{0}$ and a loss of 34 days. Six cases were restored to duty, and 1 was invalided from the service, 1 remaining under treatment.

Bronchitis acuta.—The returns gave 62 cases of acute bronchitis, with a ratio of $30.67\frac{0}{0}$, as against $19.93\frac{0}{0}$ last year. The number of sick days was 466, and the ratio of sick daily was $.62\frac{0}{0}$, while the average duration of treatment was 7.51 days. Three cases were invalided to hospital, and 1 was continued.

Bronchitis chronica.—Nine cases fell under this head, giving a ratio of $4.45\frac{0}{0}$ as against $7.05\frac{0}{0}$ in the preceding year. The time lost was 186 days, and the average duration of treatment was 20.66 days. Two cases were invalided to hospital.

Catarrhus.—There were 96 cases reported, the ratio being $47.50\frac{0}{0}$,

somewhat smaller than that of last year, $51.03\frac{0}{0}$. The number of sick days was 405, and the ratio of sick daily $.54\frac{0}{0}$. The average duration of treatment was 421 days. One case was invalided to hospital and 1 remained under treatment.

Hæmoptysis.—The Adams and the Ranger each reported 1 case, which returned to duty after an average duration of treatment of 9.5 days.

Laryngitis.—There were 3 cases on the Adams, and 1 on the McArthur and Pensacola respectively, and 1 case was invalided from each ship. The admission ratio was $2.47\frac{0}{0}$, and of the daily sick $.15\frac{0}{0}$, while the average period of treatment was 23 days.

Phthisis pneumonia acuta.—Only 1 case of this affection was noted, and it was invalided to hospital from the Ranger.

Phthisis pneumonia chronica.—Fourteen cases of chronic phthisis were reported, contributing a ratio of $6.92\frac{0}{0}$, as against $8.79\frac{0}{0}$. The daily average ratio of sick from this disease was $.42\frac{0}{0}$, and the average duration of each case 22.35 days. Two cases were able to return to duty, and 10 were invalided to hospital, 1 from the service, and 1 was continued to the following year.

Pleuritis.—Fourteen cases of pleurisy also occurred; the Essex, Hartford, and Wachusett each contributing 3. The number of sick days amounted to 357, and the daily average sick rate was $.47\frac{0}{0}$; all recovered but 3, which were invalided to hospital.

Pneumonia.—The cases of pneumonia were 11 in number, and the ratio was $5.44\frac{0}{0}$, while the loss of service was 170 days. The daily average ratio of sick was $.23\frac{0}{0}$. There were 5 recoveries, 3 were invalided, and 3 died. The ratio in each of the latter cases being $1.48\frac{0}{0}$. The fatal cases occurred on the Hartford, Pensacola, and Wachusett. The Alaska reported the largest number of cases, 5; while the other 6 occurred singly on as many ships.

DISEASES OF THE DIGESTIVE SYSTEM.

There was a total of 258 cases reported in this class, the ratio, $127.65\frac{0}{0}$, being somewhat less than that of last year, which was $140.76\frac{0}{0}$. The number of sick days was 1,476, and the daily average ratio of sick from these affections was $1.99\frac{0}{0}$. There were 119 recoveries, 15 were invalided to hospital, and 1 from the service, and there was 1 death from dysentery acuta.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $53.1\frac{0}{0}$, and the average duration of treatment, 7.1 days.

These diseases prevailed on the different ships in the following ratios per thousand, given with those of the preceding years:

Ships.	1879.	1880.	1881.	1882.
Lackawanna	250.00	230.76	224.29	253.39
Adams	116.28	63.15	96.04	169.49
Essex				158.56
Independence	71.42	109.37	111.11	148.14
Hartford				137.72
Ranger			106.38	123.06
Hassler	25.11	341.46	190.47	125.00
Iroquois				119.26
Pensacola	68.42	182.76	176.05	87.77
Wachusett		210.00	163.93	71.42
Onward	48.78	193.54	81.08	54.05
Alaska	189.47	172.16	119.70	73.27
McArthur				31.25

Ascites.—The single case of this disease was transferred to hospital from the Adams.

Cholera morbus.—There were comparatively few of the cases reported, the number being 15, and the ratio $7.42\frac{0}{0}$, while last year it was $17.59\frac{0}{0}$. All were restored to duty after an average period of 2.06 days.

Colica.—As in the last case the largest number of this disease was reported from the Lackawanna, 7 in number, while the total was but 17. The case ratio was $8.41\frac{0}{0}$, while that of last year was $14.07\frac{0}{0}$. The total loss of time was 48 days.

Congestio hepatis.—Two cases were reported from the Alaska, and 1 each from the Essex and Independence. The loss of service was 18 days, and all returned to duty.

Constipatio.—The returns show 12 cases with a ratio of $5.93\frac{0}{0}$, that of last year being $7.21\frac{0}{0}$. The loss of service was 89 days.

Diarrhœa acuta.—The ratio of admission given by 69 cases of this affection was $34.14\frac{0}{0}$, almost identical with that of last year. The daily sick rate was $.38\frac{0}{0}$, and the total loss of service 282 days, or 4.08 for each case.

Diarrhœa chronica.—Two cases of this disease gave a ratio of $.98\frac{0}{0}$, and they recovered after an average of 4.5 days.

Dysenteria acuta.—The ratio given by 18 cases of acute dysentery was $8.90\frac{0}{0}$, nearly double that of last year, $4.69\frac{0}{0}$. There were 168 sick days, and the average daily ratio of sick was $.38\frac{0}{0}$, while the average duration was 9.33 days. Eleven of the cases occurred on the Lackawanna, and one of them was fatal.

Dysenteria chronica.—The Ranger and Wachusett reported single cases of chronic dysentery, which were invalided to hospital after 15.5 days of treatment.

Dyspepsia.—Ten cases of this trouble were recorded, the ratio being $4.94\frac{0}{0}$, as against $9.97\frac{0}{0}$ last year. The number of sick days was 28; 1 case was invalided.

Fistula in ano.—Two cases of anal fistula occurred on the Alaska, and 1 on the Hartford, the latter and 1 of the former being invalided to hospital. The loss of service was 19 days.

Gastritis.—Single cases from the Alaska and Independence were reported, which recovered.

Hæmorrhoids.—There were 11 cases of this disease reported, a ratio of $5.44\frac{0}{0}$, and causing a loss of 45 days. The daily sick rate was $.05\frac{0}{0}$, and the average duration 4.09 days. Nine were restored to duty, 1 was invalided from the service, and 1 to hospital.

Hepatitis chronica.—The Hartford and Wachusett reported single cases of chronic hepatitis, which were restored to duty, after an average duration of 16 days.

Hernia.—Nineteen cases of this character were returned, of which 14 were discharged to duty, and 5 invalided to hospital. The ratios were as follows: Admission, $9.40\frac{0}{0}$, daily sick $28\frac{0}{0}$, invalided $2.47\frac{0}{0}$. The loss of time was 215 days, or 11.31 for each case.

Icterus.—Nine cases of jaundice occurred, a ratio of $4.45\frac{0}{0}$, with the loss of 123 days; 6 recovered, and 3 were sent to hospital. The average duration of treatment was 13.66 days. Three cases occurred on the Pensacola, and 2 each on the Iroquois, Adams, and Alaska.

Peritonitis.—The Hartford and Onward reported each 1 case, which recovered after an average duration of 37 days.

Pharyngitis.—This disease occurred in 14 cases, and the ratio of admission was $6.92\frac{0}{0}$; all recovered after an average period of 4.21 days.

Tonsillitis.—There were 42 cases of tonsillitis, representing a ratio of

20.78 $\frac{0}{0}$. The daily sick ratio was .22 $\frac{0}{0}$, and the loss of service 171 days, making the average duration 4.07 days. There was no invaliding.

Typhlitis.—The Pensacola reported this case, which was under observation for 6 days.

Vermes.—This disease was noted in 3 cases, all of which were restored to duty, after an average period of 5.33 days.

DISEASES OF THE GENITO-URINARY SYSTEM.

There were classed under this head 147 cases, representing a ratio of 72.73 $\frac{0}{0}$, nearly the same as that of last year, which was 71.54 $\frac{0}{0}$. The number of sick days was 1,708, and the number sick daily gave a ratio of 2.31 $\frac{0}{0}$. Of the whole number 8 were invalided to hospital, and 1 from the service, while 6 continued under treatment. The average duration of treatment was 11.61 days.

In the English squadron the ratios were: Admission, — $\frac{0}{0}$; invaliding, — $\frac{0}{0}$; death— $\frac{0}{0}$. In the German squadron the admission ratio for venereal diseases only was 124.7 $\frac{0}{0}$, and the average duration of treatment 15.2 days.

The affections of the genito-urinary organs were distributed among the ships in the following ratios, which are also given for the three preceding years:

Ships.	1879.	1880.	1881.	1882.
Essex				109.28
Onward	48.78	64.51	216.21	108.10
Independence	71.42	7.81	33.33	88.88
Lackawanna	250.00	28.84	51.40	81.44
Hartford				77.84
Alaska	189.47	32.96	27.62	77.58
Wachusett		160.00	163.93	71.42
Pensacola	68.42	57.44	65.72	69.23
Ranger		150.00	78.01	69.23
Adams	116.28	15.78	39.54	50.84
Iroquois				45.87

Albuminuria.—A single case of this disease was returned from the Lackawanna, which was invalided to hospital.

Colica nephritica.—This case occurred on the Iroquois, and recovered in two days.

Chancroides.—Twenty-six cases of this malady were reported, giving a ratio of 12.86 $\frac{0}{0}$, an increase over that of last year, which was 9.97 $\frac{0}{0}$. The resulting loss of service was 282 days, and the daily average number sick was .38 $\frac{0}{0}$. All but 3 cases recovered, 1 of which was invalided to hospital, and 2 remained under treatment. The average duration was 10.84 days.

Cystitis.—The single case of this disease was reported from the Pensacola, and was invalided to hospital.

Enuresis.—The Hartford and Independence reported single cases, and the latter was invalided.

Gonorrhœa.—There were 58 cases of this malady reported, contributing a ratio of 23.75 $\frac{0}{0}$, a small falling off from that of 1881, which was 26.39 $\frac{0}{0}$, and the loss of service was nearly the same, 759 days. The disease prevailed most extensively on the Essex, which reported 11 cases, and there were 7 on the Alaska, Hartford, Independence, and Lackawanna respectively. The ratio of the daily sick from this affection was 1.02 $\frac{0}{0}$, and the average duration of treatment was 13.08 days.

Of the total number, 3, or $1.58\frac{0}{0}$, were invalided to hospital, and 1 was continued.

Hæmaturia.—There were 2 cases, occurring on the Hartford and Pensacola, which were returned to duty.

Orchitis.—There were 44 cases entered under this head, making a ratio of $21.77\frac{0}{0}$, a little larger than that of last year, which was $20.52\frac{0}{0}$. The loss of service was 519 days, and the daily average number of sick was in the ratio of $.68\frac{0}{0}$. One case was invalided, and 2 were continued. The Lackawanna, Hartford, and Essex contributed most largely to the number reported.

Paraphymosis.—There were two cases recorded on the Lackawanna and Pensacola, which were cured, the average duration of treatment having been 15 days.

Phymosis.—The Ranger reported one case, which was under treatment 4 days.

Urethra strictura.—Seven cases of this trouble were included in the returns, a ratio of $3.46\frac{0}{0}$ as against $5.86\frac{0}{0}$ last year. The loss of service was 90 days, and the average duration of treatment 12.85 days. Two cases returned to duty, 2 were invalided to hospital, and 1 from the service.

Varicocele.—The Independence and Lackawanna each reported 1 case, both of which returned to duty.

DISEASES OF THE LOCOMOTIVE SYSTEM.

This class of diseases contained but 6 cases, 3 of synovitis, and single cases of ankylosis, hydrochs articularum, and necrosis. The ratio of admissions was $2.96\frac{0}{0}$, and the loss of service 28 days. All returned to duty, except 1 case of synovitis, which was continued. The 7 cases occurred singly, on as many ships.

DISEASES OF THE INTEGUMENTARY SYSTEM.

The number of cases reported under this head was 185, giving a case ratio of $91.53\frac{0}{0}$ against $83.87\frac{0}{0}$ last year. The total loss of service from these affections was 1,669 days, and the daily average number sick $2.26\frac{0}{0}$. Of the total number, 21 were invalided to hospital, a ratio of $10.39\frac{0}{0}$, and 1 from the service, while 2 were continued. The average duration of treatment was 17.35 days.

In the English squadron the ratios were: Admission, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $157.0\frac{0}{0}$, and the average duration of treatment 20.1 days.

Diseases of the skin occurred in the following ratios per thousand on the various ships of the squadron, and three ratios for three preceding years are also given for comparison:

Ships.	1879.	1880.	1881.	1882.
Independence.....	71.42	46.87	55.55	257.85
Ranger.....			92.19	153.84
Wachusett.....		150.00	87.43	125.00
Onward.....		32.25	108.10	108.10
Hartford.....				95.80
Lackawanna.....	83.33	139.42	154.19	95.02
Essex.....				92.89
Iroquois.....				82.56
Alaska.....	101.75	91.57	50.19	77.58
Adams.....	75.58	89.47	45.19	73.44
Hassler.....	100.45	219.51	23.80	50.60
Pensacola.....	123.68	122.71	89.20	25.54

Abscessus.—There were 45 cases of this character, giving a ratio of $22.26\frac{0}{0}$ as against $25.21\frac{0}{0}$ in 1881. The resulting loss of service was 610 days, and the average of daily sick $.46\frac{0}{0}$. Six persons were invalided to hospital, a ratio of $2.96\frac{0}{0}$. The average duration of treatment was 13.55 days. The largest number of cases happened on the Independence, 11 cases; and there were 5 on the Ranger and 5 on the Alaska.

Anthrax.—The Ranger reported 2 cases, and Wachusett 1, and the ratio of admissions was $1.48\frac{0}{0}$. All the cases recovered after an average duration of 8.66 days.

Ecthyma.—Single cases were returned from the Lackawanna and Ranger, which involved an average loss of 13 days.

Eczema.—But one case of this eruption was noticed, which was reported from the Pensacola.

Erythema.—There were 2 cases of this character reported from the Alaska and Wachusett.

Furunculus.—This affection, the largest factor of the class, contributed 62 cases, with a ratio of $30.67\frac{0}{0}$, somewhat smaller than that of last year, $34.60\frac{0}{0}$. The loss of service was 206 days, and the ratio of the daily sick was $.40\frac{0}{0}$, and the average duration of treatment was 4.93 days. The largest number of cases occurred on the Lackawanna, Essex, and Alaska.

Herpes.—Nine cases of this eruption were noted, giving a ratio of $4.45\frac{0}{0}$. The number of sick days was 80, and the daily sick numbered $.10\frac{0}{0}$. Eight were restored to duty, and 1 invalided to hospital.

Onychia.—The Pensacola had 2 cases of this affection, both of which recovered after 3 days.

Paronychia.—The returns included 13 cases of this disease, a ratio of $6.43\frac{0}{0}$ as against $4.69\frac{0}{0}$ last year, with a loss of service of 118 days. One case was invalided to hospital.

Pemphigus.—The Alaska contributed 2 cases, and the Pensacola and Ranger each 1 case of this character, 3 of which recovered, and 1 was continued. The average duration was 11 days.

Pernio.—Two cases of chilblain were reported from the Wachusett, while in Alaska.

Psoriasis.—A single case of this eruption occurred on the Iroquois, which was invalided to hospital, not having recovered after 51 days of treatment.

Scabies.—The 16 cases reported of this eruption occurred on the Independence, and 8 were invalided, with one exception, which was continued for treatment. The loss of service was 110 days. Most of the cases occurred on ships returning from the Arctic.

Tinea.—Two cases of this affection came under notice on the Alaska and Independence, and recovered after an average duration of 11.5 days.

Ulcus.—There were 19 cases of this character, giving a ratio of $9.40\frac{0}{0}$ as against $7.62\frac{0}{0}$ last year. The loss of service was 219 days, and the ratio of sick daily was $.29\frac{0}{0}$. Four were invalided to hospital, or $1.97\frac{0}{0}$. The average duration of treatment was 11.52 days.

Urticaria.—One case occurred on the Ranger, and caused a loss in time of 16 days.

Verruca.—A single case on the Iroquois was under treatment for 19 days, and recovered.

DISEASES OF THE ABSORBENT SYSTEM.

The cases falling within this class were 56 of adenitis, giving a ratio of $27.70\frac{0}{0}$ as against $22.28\frac{0}{0}$ last year. The resulting loss of service was

972 days, and the ratio of the daily sick $1.31\frac{0}{0}$. Eight were invalided to hospital and 1 continued. The average loss of service was 17.38 days. By far the largest ratio occurred on the Ranger, which reported 14 cases, a ratio of $107.69\frac{0}{0}$.

NON-MALIGNANT TUMORS AND CYSTS.

This class was represented by 3 cases, 2 of cystitis and 1 of sarcoma, contributed by the Independence and Ranger. The number of sick days was 20.

POISONS.

The diseases reported under this head were 4 of poisoned wounds, 1 of lead poisoning, and the remainder, 28, were the result of excessive use of alcohol. Thirty-three cases gave a ratio of $16.32\frac{0}{0}$, a large diminution from that of last year, which was $34.60\frac{0}{0}$. The resulting loss of service amounted to 100 days, and the ratio of the daily sick was $.3\frac{0}{0}$. With the exception of 2 cases of alcoholism, which were continued, all recovered, and the average duration was 6.66 days. Three cases of vulnus venenatum on the Hassler gave the largest ratio of the several vessels, or $75.0\frac{0}{0}$. Next came the Essex with a ratio of $32.67\frac{0}{0}$ resulting from 6 cases of alcoholism, then the Ranger with $30.76\frac{0}{0}$ from the same cause. The single case of colica pictonum was reported from the Lackawanna.

VIOLENT DISEASES AND DEATHS.

The number of cases resulting from injuries were reported as being 378, giving a ratio of $187.03\frac{0}{0}$, very little differing from that of the preceding year, $192.57\frac{0}{0}$. The loss of service amounted to 3,310 days, and the daily ratio of sick was $4.48\frac{0}{0}$. The invalided were 14, or $6.92\frac{0}{0}$, and there were 2 deaths, or $.98\frac{0}{0}$. Eight were continued to the following year. The average duration of disease was 8.85 days.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; deaths, $—\frac{0}{0}$. In the German squadron the admission ratio was $124.7\frac{0}{0}$, and the average duration of treatment 13.1 days.

The following table displays the ratios of diseases from violence on the various ships, for the period covered by the report, as well as for three preceding years:

Ships.	1879.	1880.	1881.	1882.
Iroquois				247.70
Hartford				227.54
Ranger			127.65	215.37
Wachusett		290.00	207.65	214.28
Lackawanna	230.39	240.38	275.70	212.60
Adams	133.71	52.68	56.44	197.74
Essex				196.71
Independence	166.66	62.5	155.55	177.77
Alaska	270.17	212.45	19.691	168.10
Pensacola	215.52	295.03	281.69	156.41
Onward	195.12	96.87	81.08	81.08
Hassler	100.45	73.17	166.66	75.00
McArthur		29.41	68.97	31.25

Abrasio.—Sixteen cases gave a ratio of $7.91\frac{0}{0}$, as against $6.45\frac{0}{0}$ last year. The loss of service was 90 days, and the ratio of daily sick was $.11\frac{0}{0}$. All returned to duty after an average period of treatment of 5.62 days.

Ambustio.—There were 19 cases of burn, which gave a ratio of $9.40\frac{0}{00}$, and a loss of service of 176 days. The cases were all returned to duty, the average period of treatment having been 9.26 days, and the daily average number sick $.23\frac{0}{00}$. The Pensacola and Independence each contributed 4 cases.

Concussio cerebri.—A fatal case of this injury occurred on the Alaska.

Concussio spinalis.—The Hartford reported 1 case of this injury, which was under treatment 6 days, and recovered.

Contusio.—The contusions reported were 99, giving a ratio of $48.98\frac{0}{00}$, smaller than that of last year, which was $63.93\frac{0}{00}$. The number of sick days was 550, and the daily average number sick $.74\frac{0}{00}$. Two were invalided and 2 continued, and the average duration of treatment was 5.55 days.

Fractura.—There were 24 cases of fracture, which is in the ratio of $11.87\frac{0}{00}$, a considerable increase over that of last year, $4.69\frac{0}{00}$. The number of sick days was 526, and the daily sick rate $.71\frac{0}{00}$. Nine cases, a ratio of $4.45\frac{0}{00}$, were invalided to hospital, and 2 were continued. The average duration of treatment was 21.91 days. The Essex reported the largest number, 6.

Luxatio.—A single case of dislocation occurred on the Wachusett, which was transferred to hospital after 26 days of treatment on board.

Stremma.—There were 91 cases of sprain returned, a ratio of $45.02\frac{0}{00}$, as against $47.50\frac{0}{00}$ last year. The loss of service was 752 days, and the average duration of treatment 8.26 days. Two cases remained under treatment and all the others returned to duty.

Vulnus contusum.—There were 44 cases of contused wounds, contributing a ratio of $21.77\frac{0}{00}$, and a loss of 409 days. All returned to duty with 1 exception, after an average duration of 9.29 days. The daily ratio of sick was $.55\frac{0}{00}$.

Vulnus incisum.—Twenty-nine cases of incised wounds gave a ratio of $14.34\frac{0}{00}$, as against $11.73\frac{0}{00}$ in 1881. The daily sick rate was $.23\frac{0}{00}$, and the average duration of treatment 6.06 days. One was invalided to hospital.

Vulnus laceratum.—A ratio of $15.83\frac{0}{00}$ was contributed by 32 cases of this injury, nearly double that of last year, $8.79\frac{0}{00}$. The number of sick days was 399, the daily sick rate $.53\frac{0}{00}$, and the average duration of treatment was 12.46 days. One case was invalided, 1 died, and 1 was continued.

Vulnus punctum.—Eighteen cases of punctured wounds were reported, and the ratio of $8.90\frac{0}{00}$, with a loss of 128 days. The daily ratio of sick was $.17\frac{0}{00}$, and all the cases recovered on board, after an average period of 7.11 days.

Vulnus sclopetarium.—Two gunshot wounds occurred on the Pensacola, which were restored to duty, after 35 days of treatment in each case.

NAVAL HYGIENE.

ADAMS.

This vessel spent the first three months of the year on the coast of Peru, from whence she went to San Francisco, calling at Panama en route. Leaving Mare Island September 12, after necessary repairs, she arrived October 1, at Sitka, Alaska, where she remained during the rest of the year. She was 313 days in port, and 52 at sea.

In the zymotic class of diseases 33 cases occurred on board, giving a ratio of $186.44\frac{0}{00}$, a very large increase over that of last year, which was $79.09\frac{0}{00}$. The cases were chiefly of malarious fevers, 16 of intermittent and 12 of remittent fevers. Two cases, a ratio of $11.29\frac{0}{00}$, were invalided to hospital. The total loss of service was 196 days, and the daily average ratio of sick $2.99\frac{0}{00}$; the average duration of treatment was 5.93 days.

The constitutional class gave 27 cases, being in the ratio of $152.54\frac{0}{00}$, which is smaller than that of last year, $192.09\frac{0}{00}$. The cases were 10 of syphilis, 13 of rheumatism, and 4 of adynamia. The time lost was 155 days, and the daily average sick rate $2.37\frac{0}{00}$, while the average duration of treatment was 5.74 days. The invaliding rate was as follows: To hospital $16.96\frac{0}{00}$, and from the service $5.64\frac{0}{00}$.

Affections of the nervous system numbered 11, the ratio being $62.14\frac{0}{00}$, neuralgia, 9 cases, constituting the largest factor. The ratio of sick daily was $.94\frac{0}{00}$, and the average duration of treatment was 5.74 days, the total loss being 64 days. Three cases, or $11.96\frac{0}{00}$, were invalided.

The respiratory class of diseases gave 23 cases, the ratios being, admission $129.94\frac{0}{00}$, invaliding $33.89\frac{0}{00}$, and daily sick $2.76\frac{0}{00}$. The total loss of service was 180 days, and the average duration of treatment 7.82 days.

Diseases of the digestive system contributed 20 cases, or $169.49\frac{0}{00}$, as against $96.04\frac{0}{00}$ last year. The ratio of the daily sick was $1.92\frac{0}{00}$, and that of the invalided $16.96\frac{0}{00}$. There was a loss in service of 127 days, making the average period of treatment 4.23 days.

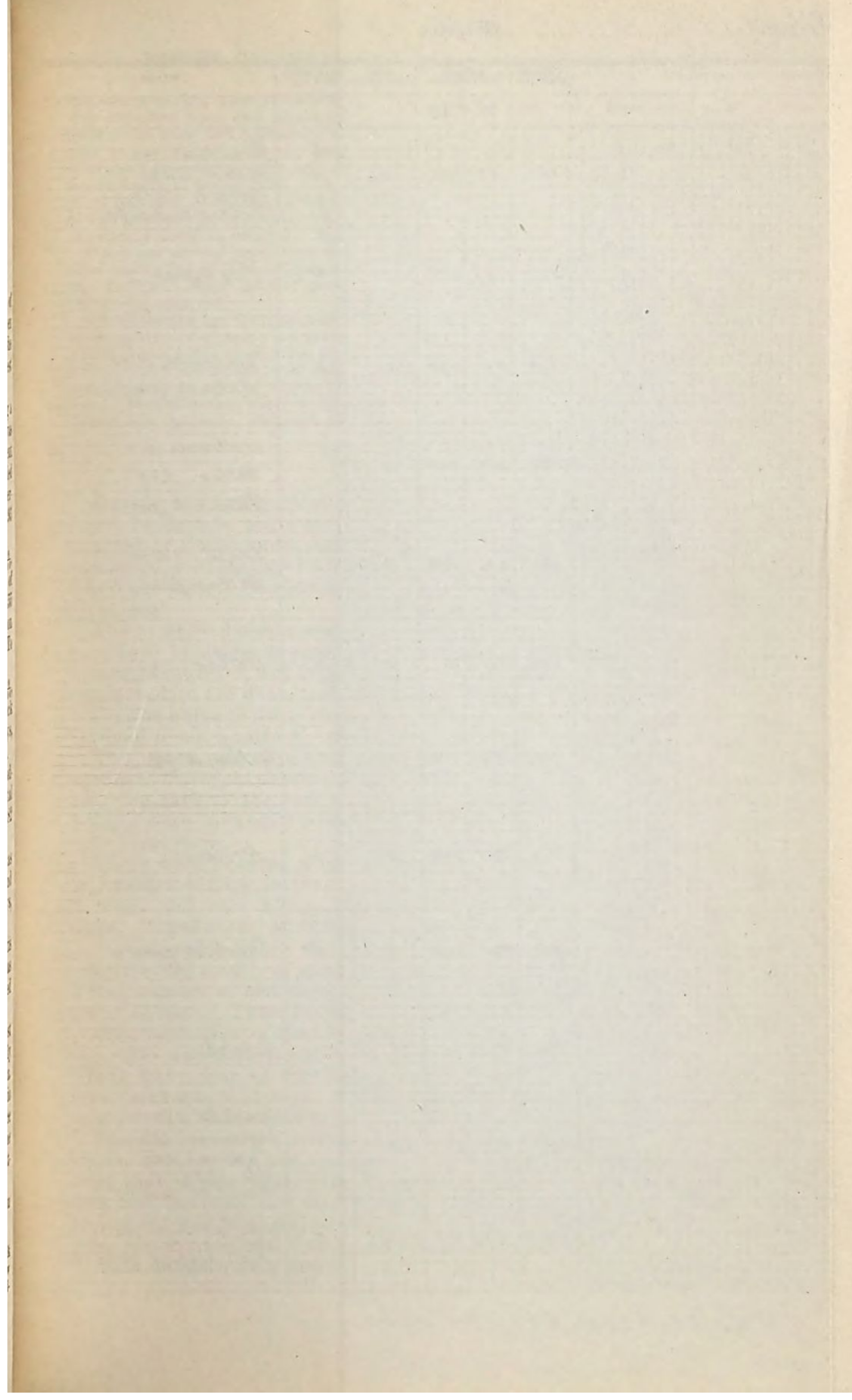
The genito-urinary cases were 9 in number, of which 6 were orchitis and 2 strictura urethræ, and but 1 of gonorrhœa. The ratio of cases was $50.84\frac{0}{00}$, and of the daily sick $1.18\frac{0}{00}$, while the loss of service amounted to 80 days.

There were 13 cases of skin diseases, a ratio of $73.44\frac{0}{00}$, as against $45.19\frac{0}{00}$ last year. The number of sick days was 99, and the daily average sick rate $1.52\frac{0}{00}$. The cases were of furunculus and paronychia.

The number of cases of sickness resulting from violence was 35, a ratio of $197.94\frac{0}{00}$, as against $56.44\frac{0}{00}$ last year, and the resulting loss of service was 307 days. Four cases, or $21.58\frac{0}{00}$, were invalided to hospital. The daily average sick rate was $4.74\frac{0}{00}$, and the average duration of treatment 8.77 days.

The following extracts are made from the sanitary report of Surgeon J. G. Ayers:

A ship of this class stationed in Alaska during the winter should have the spar-deck covered with a house. This is quite necessary for the health and comfort of the crew and for carrying on the drills under cover. An attempt was made by the command-



U. S. S. *Alaska*.

J. Kiland

, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK. (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											240	22	19.7	0	4	Pico, Peru 182 Callao 3 to 8 Iquique 13 to 14 Valparaiso, Chile from 18
February											240	20.7	18.4	1	4	Valparaiso
March											240	21.3	17.7	0	1	Valparaiso to 31 Hollendo from 26
April											235	26.2	24.4	0		Hollendo to 5 Callao 8 to 9 Panama from 16
May											235	22	19.4	0		Panama 8 to 14 Callao from 18
June											235	17.8	16	0	6	Callao
July											232	17.8	15.4	0		Callao to 29
August											232	26.3	24.4	1	5	At sea
September											232	27.8	25.4	0	5	Honolulu from 6
October											220	27.2	25	1		Honolulu
November											220	25.9	23.5	3		Honolulu 173 Lahaina 3 to 5 Makana 6 to 7 Hilo 8 to 13 Honolulu from 14
December											220	18.8	12.4	2		San Francisco 16 to 18 Star Island from 19

* Robert Whiting, P.A. Surgeon, March. J. R. Tryon, Surgeon, from April

† Berth Deck shellacked

ing officer to obtain one at Mare Island, but none being furnished, green spruce lumber was obtained here, and, about the middle of November, a structure was put up between the poop and mainmast, and forward between the bridge and fore-castle, the roof extending out over the hammock nettings. The ends next to that part of the spar-deck uncovered were left open. Though constructed with much care, the roof leaks badly in heavy rains with high winds, but this has been infrequent, and the fault has been corrected in the forward house by putting an awning over it. Only rough lumber can be obtained here, which is wholly unfit for a house, and not much expense is saved by using it. Suitable material should be furnished at the navy-yard.

Since our arrival here there has been one case of rubeola and three cases of scarlatina among the white residents, and, so far as can be learned, no cases of either among the Indians. Some cases of pertussis and varicella both among whites and Indians have also occurred.

The Russians are very inferior in physical stamina. The scrofulous cachexia seems to be general, and many are invalids from some cause or other almost the year round. The Indians suffer much from general syphilis and diseases of the lungs. Pulmonary tuberculosis is common, and since the appearance of cold weather there have been a considerable number of deaths from pneumonia. They are unprotected by vaccination. It is said that there were no deaths from measles among the Indian children, in the late epidemic, although there were many cases.

i

ALASKA.

During the first quarter of the year this vessel was at Valparaiso 62 days, 14 days in ports on the Peruvian coast, and 14 at sea. She remained at Callao until July, when she sailed for Honolulu, where she remained, visiting other ports of the Hawaiian Islands, until September, when she went to San Francisco. Her service was 272 days in port and 82 at sea.

The zymotic diseases were noted in this ship in 26 cases, contributing a ratio of $112.06\frac{0}{00}$, as against $142.85\frac{0}{00}$ in 1881. There were 10 cases of intermittent fever, 2 of typhoid, and 1 of erysipelas. The loss of service amounted to 188 days, and the average ratio of sick daily was $2.19\frac{0}{00}$, while the average duration of treatment was 7.23 days. Two cases of typhoid fever, a ratio of 8.62, were invalided to hospital.

The constitutional diseases yielded 33 cases, a ratio of $142.24\frac{0}{00}$, as against $115.83\frac{0}{00}$ in the preceding year. The loss of service was 589 days, and the ratio of the sick daily was $6.93\frac{0}{00}$. Two cases of syphilis, or $8.62\frac{0}{00}$, were invalided to hospital; the average duration of treatment was 17.84 days.

There were 15 cases of nervous disorders, making a ratio of $64.65\frac{0}{00}$, as against $46.33\frac{0}{00}$, in 1881. The loss of time was 168 days, the daily average sick rate $1.98\frac{0}{00}$, and the average duration of treatment 11.2 days. Three cases, or $12.93\frac{0}{00}$, were invalided to hospital.

Sixteen cases fell in the class of diseases of the respiratory system, contributing a ratio of admission of $68.53\frac{0}{00}$, and of daily sick of $2.84\frac{0}{00}$. Total number of sick days was 241, and the average duration of treatment 15 days. Three cases, or $12.93\frac{0}{00}$, were invalided to hospital.

Seventeen cases of disorders of the digestive system were returned, and the ratio was $73.27\frac{0}{00}$, while the number sick daily gave a ratio of $1.25\frac{0}{00}$. There was a loss of service of 108 days, and the average duration of treatment was 6.35 days. One case of icterus and 1 of anal fistula were invalided, a ratio of $8.64\frac{0}{00}$.

The diseases of the genito-urinary system numbered 18 cases, gonorrhœa, chancroides, and orchitis. The ratio was $77.58\frac{0}{00}$, a large increase over that of last year, which was $27.02\frac{0}{00}$. The sick days numbered 285, and the daily sick rate was $5.90\frac{0}{00}$, while the average duration of treatment was 15.83 days. A case of urethral stricture was invalided from the service, and 1 of gonorrhœa to hospital.

Skin diseases were noted in 18 cases, a ratio of $77.58\frac{0}{00}$, as against

50.19 $\frac{0}{100}$ last year. The loss of service was 265 days, and the daily sick rate 3.10 $\frac{0}{100}$. One case of abscess was invalided to hospital.

There were 39 cases of injuries recorded, giving a sick rate of 168.10 $\frac{0}{100}$, and a daily average ratio of 4.87 $\frac{0}{100}$. The number of sick days was 413, and the average duration 10.58 days. Three cases, or 12.93 $\frac{0}{100}$, were invalided to hospital, and there was 1 death from *concussio cerebri*.

ESSEX.

This vessel sailed from Hampton Roads early in January to join the Pacific squadron, which she reached in July, having touched at various points on the African and South American coasts during her passage. The last quarter of the year was spent on the coast of Chili and Peru. She was at sea 154 days during the year, and in port 211 days.

The zymotic class of diseases was chiefly represented on this ship by 7 cases of febricula and 59 intermittent fever. The ratio of admissions was 71.03 $\frac{0}{100}$, and of the daily sick .87 $\frac{0}{100}$. Sixty-one sick days gave an average of 4.69 for each case. One case of *febris continua simplex* was or invalided to hospital.

Constitutional diseases numbered 27, giving a ratio of 147.54 $\frac{0}{100}$ and a daily sick rate of 7.75 $\frac{0}{100}$, chiefly produced by 16 cases of syphilis, and 7 of acute rheumatism. The loss of service amounted to 519 days, and the average duration of treatment was 7.75 days. Three cases, 16.39 $\frac{0}{100}$, were invalided to hospital.

Of diseases of the nervous system the Essex returned but 6 cases, 2 each of *epilepsia* and *nausea marina*, and 1 each of *vertigo* and *cephalalgia*. The ratio of admission, therefore, was 32.67 $\frac{0}{100}$, and of the daily sick 1.03 $\frac{0}{100}$. The loss of service was 71 days, and the average duration 11.83 $\frac{0}{100}$. One case was invalided.

Diseases of the respiratory system numbered 23 cases, or 124.59 $\frac{0}{100}$, giving a daily sick rate of 3.0 $\frac{0}{100}$. The cases included 17 of *catarrhus* and 3 each of acute and chronic *phthisis*, 2 of which were invalided. The loss of service was 201 days, and the average duration of treatment 8.73 days.

In the class of diseases of the digestive system were included 29 cases, giving an admission ratio of 158.46 $\frac{0}{100}$, and a daily sick rate of 3.49 $\frac{0}{100}$. The largest factors were *pharyngitis* and *hernia*, the considerable number of admissions for the latter being due to repeated admissions of the same subject. The loss of service from these affections was 237 days, an average of 8.17 for each case.

The genito-urinary cases numbered 20, giving the very considerable ratio of 109.28 $\frac{0}{100}$, greater than that of any other vessel of the squadron. This was due to the frequency of *gonorrhœa* on board, 11 cases being returned, with 6 of its sequel, *orchitis*. The loss of service was 177 days, an average of 8.85 for each case. The daily sick rate was 2.62 $\frac{0}{100}$, and the invaliding 5.46 $\frac{0}{100}$.

Skin diseases contributed 17 cases, with the ratio of 92.89 $\frac{0}{100}$, and a loss of service of 105 days. *Furunculus* and *abscessus* were the chief factors. The daily sick rate was 1.53 $\frac{0}{100}$, and the average duration of treatment 6.17 days. There was no invaliding.

There were reported 38 cases resulting from violence, the ratio being 196.71 $\frac{0}{100}$. The loss of service was 311 days, and the daily average ratio of sick 4.64 $\frac{0}{100}$. Two cases of *fractura* were invalided, the ratio being 10.92 $\frac{0}{100}$. The average duration of treatment was 8.63 days.

Surgeon M. L. Ruth makes the following notes in his report:

The ship has enjoyed immunity from epidemic and endemic disease, and the crew has been remarkably efficient, cheerful, and contented. This has been due, I am con-

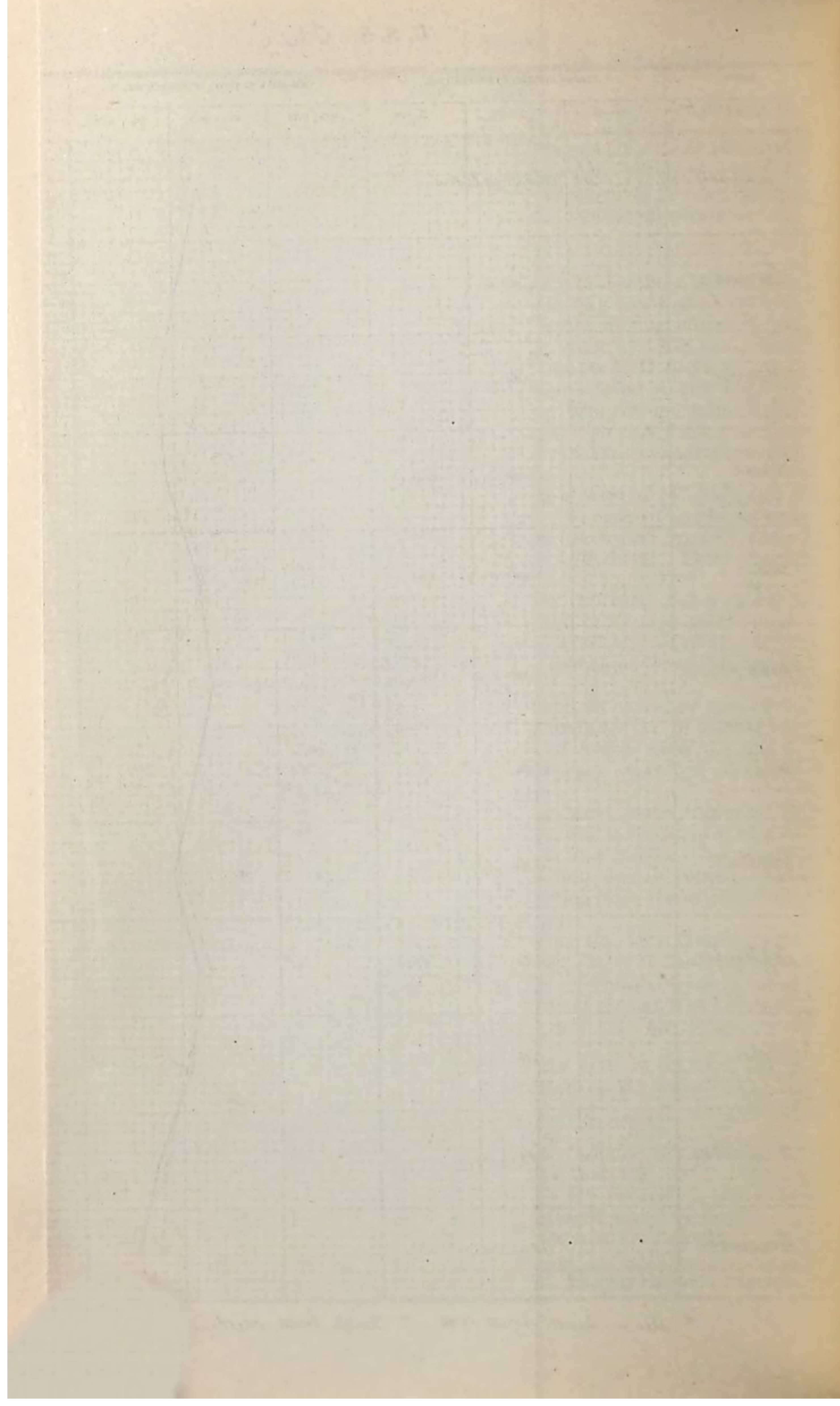
U. S. S. *Essex*

M. L. Ruth

, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW OR RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spac-deck.			
1882																
January	No observations										193	19.4	12.1	10	5	Norfolk to 9th.
February		do.									143	22.3	18.6	1	4	Lunchal 5 to 10 Santa Cruz 14 to 17 Porto Piraya 26 & 27
March		do.									193	25.4	24.7	7	4	Porto Grande to 10 Porto Piraya 12 & 13 Monrovia 24 to 28 Bassa 30
April		do.									190	28.4	26.4	8	6	Simon 1 Cape Palmas 3 & 4 At sea
May		do.									180	20.9	15.8	4	4	Montevideo from 16
June		do.									180	18.8	8.4	7	3	Montevideo to 9 Elizabeth Island 22 to 25 Sandy Point 26 to 29
July		do.									180	*	19.2	10	1	Magellan Straits to 7 Valparaiso 22 to 28
August		do.									180	19.3	14.3	1	† 3	Coquimbo from 4
September		do.									180	19.5	15.4	0	4	Coquimbo to 11 Valparaiso 13 to 25
October		do.									180	22.1	18.3	0	3	Iquique 4 to 6 Anca 9 to 11 Callao from 18
November		do.									180	20.6	19.1	0	4	Callao
December		do.									180	19.5	19.5	4	6	do

* Steam heat 1st to 15th. † Berth Deck shellacked



vinced, to the protection of the men by awnings during the heat of the day, and at night when in port; to constant supervision of their clothing, particularly their under wear and shoes; to allowing the widest latitude in the commuting of rations; to the use of fresh meats and vegetables whenever these were procurable; to the system of classification in regard to liberty, by which if a man behaves properly he is allowed to go on shore as often as he wishes; to the frequent issue of money, by which the men have been enabled to enjoy themselves properly and soberly on shore, and to provide themselves with luxuries; to the encouragement of a spirit of manliness and pride in themselves and in the ship, and lastly to the use of distilled water. Until the arrival of the ship at Callao no shore water had been used, but, as our stay here promised to be long, an attempt was made to introduce it. Intestinal troubles, mild diarrhœa, dysentery, and tænia solium showed themselves almost immediately. The use was then discontinued for drinking, but it was still received on board for washing purposes. Two of the crew of the *Swiftsure*, the flag-ship of the English squadron, having died of typhoid fever, and several more being prostrated by the disease, it was thought proper to recommend the total exclusion of shore water. This recommendation being immediately accepted, the water from the shore was discontinued. Distilled water is so easily made, is so palatable, and so well aerated that its use should be made obligatory on board ships of war. Shore water is so fertile a cause of disease that its use should be prohibited by regulation. It would be better not to use it even for washing purposes, for, despite sentries, and the vigilance of captains of the hold, the men will often drink it if it is easier to get than the distilled, or if, as occasionally happens, the scuttle butt be low.

In regard to the ration, something should be done in the matter of its packing. Salt beef and pork are placed on board ships in packages of 200 pounds, more or less. On large ships, where the whole quantity is used at one serving, no evil results, but on small ones like this a portion is left over until the next issue. This, placed in the harness cask, must necessarily undergo deterioration before it can be used. Sugar, molasses, vinegar, coffee, and tea are all furnished in bulk. They lose in quality after being opened, and consequently the men do not get the ration intended for them.

As Callao is the port at which the ships of the various squadrons rendezvous, and a central point for vessels of our own squadron, and as the hospital accommodations here are limited and inferior, I would recommend the establishment of a small hospital here. Could the co-operation of other nations be secured an international naval hospital would fill the want. Such an establishment, officered in turn by the countries having fleets in these waters, would be of the greatest benefit.

If this idea is not practicable a floating hospital should be established on the U. S. S. *Onward*, or on a larger vessel in her place. Lima is nine miles away. Its hospitals are crowded, and, I regret to say, neither well managed nor clean. The only hospital to which our men can be sent with safety is the hospital Française de Bienfaisance. Here they are well taken care of, but the price of subsistence, \$1.15 gold per diem, added to the cost of transportation brings the expense of maintaining men to such a figure that surgeons and commanding officers hesitate to avail themselves of its privileges. The result is that patients are kept on board ships greatly to their own detriment, and greatly to the destruction of the *morale* and comfort of the ship's company, or else they are invalided home at a cost which would go far toward supporting a small shore or floating hospital.

HARTFORD.

This vessel was commissioned in June, and sailed in the following August for the Pacific. Touching at Madeira and Montevideo, en route, she passed through the Straits of Magellan, and arrived, near the close of the year, at Valparaiso, Chili. She was 88 days in port, and 96 at sea.

In the zymotic class there were returned 13 cases, of which 9 were intermittent fever and 1 remittent fever, the latter being invalided. The ratio of admission was $77.84\frac{0}{0}$, and of the daily sick $.87\frac{0}{0}$. There was a loss of time of 50 days, or 3.07 for each case.

The constitutional class yielded 19 cases, of which 8 were of rheumatism and 9 of syphilis. The case ratio was $113.77\frac{0}{0}$, and the daily ratio of sick $8.80\frac{0}{0}$. The loss of time equaled 519 days, the average duration being 19.22 days. Three cases, a ratio of $17.96\frac{0}{0}$, were invalided.

Diseases of the nervous system were reported in 21 cases, giving of this class the largest ratio from the squadron, $125.74\frac{0}{0}$. The cases were chiefly of neuralgia and cephalalgia. The time lost was 147 days, and the daily sick ratio was $4.73\frac{0}{0}$. There was no invaliding.

Diseases of the respiratory system also yielded a large ratio, $179.64\frac{0}{00}$, from 30 cases. The average number of sick daily was in the ratio of $11.97\frac{0}{00}$, and the average duration of treatment was 12.66 days, the sum of the sick days being 368. One case of pneumonia was fatal. There was no invaliding.

Under the head of diseases of the digestive system there were reported 23 cases, which yielded a ratio of $137.72\frac{0}{00}$, and the number sick daily was in the ratio of $4.55\frac{0}{00}$. The total number of sick days was 141, and the average duration of treatment 6.13 days. A case of hernia and 1 of fistula in ano were invalided.

Diseases of the genito-urinary system occurred in 13 cases, a ratio of $77.84\frac{0}{00}$. The invaliding ratio from 2 cases was $11.07\frac{0}{00}$, and the daily sick rate was $5.38\frac{0}{00}$. There were 166 sick days, an average of 12.67 per case.

Integumentary diseases were noted in 16 cases, or $95.80\frac{0}{00}$, and the number sick daily was $5.80\frac{0}{00}$. The loss of service was 180 days, and the average duration of treatment 11.28 days.

Wounds and other injuries were noted in 38 cases, yielding a ratio of $277.54\frac{0}{00}$, while the ratio of daily sick was $12.63\frac{0}{00}$. The time lost was 360 days, and the average duration of treatment 10.26 days. There were no deaths and no invalidings.

In his sanitary report for this ship, Medical Inspector S. D. Kennedy makes the following notes :

Since previous reports respecting the Hartford, she has been thoroughly repaired, and several important changes made in her. Her upper deck has been taken off, and she is now a single-deck ship. The arrangement of the berth-deck has been changed, and a system of ventilation introduced. The berth allows 121 cubic feet of air-space per man, or, including all of the space fore and aft, and all of the officers and men, $164\frac{1}{2}$ cubic feet. The warrant officers' mess-room allows $165\frac{1}{2}$ cubic feet and their state-rooms 195 cubic feet per man. The steerages allow 118 cubic feet per man. There are no berths, the officers slinging in cots and hammocks. The ward-room country gives 326 and the state-rooms 190 cubic feet per man. The captain's cabin contains 2,242, and his state-room 429 cubic feet. The admiral's cabin has 3,116, and his state-room 429 cubic feet. In the after cabin there are 1,365 cubic feet. As the space under the fore-castle is open, no estimate has been made of its air capacity. Ventilation is effected by means of hatches, windsails, air-ports, and two Sturtevant's rotary blowers, with engines attached, which are arranged to exhaust the air from, or force it into, all parts of the ship. On the berth-deck there are four hatches besides those of the engine and fire rooms, and thirty six 11-inch and two smaller air-ports. The ward-room has two large and one small hatch aft over the pantry, and twelve 11-inch and four smaller air ports. The cabins are ventilated by hatches, and large side and stern windows. There is also a hatch on the poop-deck which ventilates the shaft-alley. The fire and engine rooms have each a hatch. There are three windsails for the berth-deck, one each for fire and engine rooms, and two for the ward-room. The blowers were used for ventilating and drying the ship six times, covering a space of nineteen days in the third quarter, and the same number of times and days in the fourth quarter. As the ship was under sail most of the time, they could not oftener be used economically or conveniently. They were used chiefly to exhaust the foul air, but were also employed to force fresh air in. The exhaust seems to be the best method. As they now are run by the large boilers, their use has been confined to times when steam has been used for other purposes. To run them at other times would involve expense, and in some places a heating of the ship that would counterbalance their good as ventilators. A small boiler that would require little coal, and heating of the ship, would enable them to be used more frequently at times when they would do much good. There is another defect which ought to be remedied. The pipes coming into the rooms have an open communication with the bilges, so that when the blowers are not in operation the air from the bilges comes up. This weight would be prevented by a proper valve.

When used, this system has given satisfaction both as regards ventilation and drying the ship. The bilges are everywhere easy of access, easily kept sweet and clean, and have always been in good condition.

The sick bay has been moved from the forward part of the deck to abreast of the fire-room on the port side. It contains 1,248 cubic feet air-space, and allows eight men to swing comfortably in it. It is heated by steam-pipes, and is lighted and ventilated

by three large air-ports and eleven windows in the bulkhead on the deck. Three pipes from the blowers lead into it. It is fitted with a bath-tub for hot and cold water and a water-closet. The dispensary is opposite on the starboard side. It is large and well arranged, but would be more convenient if it adjoined the sick bay.

The prison is on the forward part of the berth-deck, and contains 278 cubic feet air-space. It is lighted and ventilated by two barred windows in the doors, and holes bored in the walls all around.

The ship is well lighted by the hatches and air-ports, and heated by steam-pipes.

The condensed water has been of good quality, and the tanks have been kept in good order. Their capacity, 6,000 gallons, is, however, too small to allow the proper aeration and cooling of the water unless the distiller is constantly in operation, or a small allowance served out.

The clothing of the men is sufficient for health and comfort, except as regards storm suits. It would greatly conduce to the health of the crew if all of the men could be fitted out with water-proof suits, and some place set apart for drying and storing them when not in use.

HASSLER.

The Coast Survey steamer Hassler was at San Francisco for the first four months of the year, and she was then employed along the coast in making surveys as far as Alaska, from whence she returned to Mare Island about the close of the year.

Of the zymotic diseases, she had but 3 cases, 2 of simple continued fever and 1 of morbilli, the latter being invalided to hospital. The case ratio was $75.0\frac{0}{0}$, and the loss of service was but 7 days.

In the constitutional class there were but 2 cases, 1 of rheumatism and 1 of syphilis, which gave a loss of service of 14 days.

There were no cases recorded in the nervous or respiratory classes.

Five cases were noted among diseases of the digestive system, and the ratio was $125.0\frac{0}{0}$. The average duration was 1.6 days.

Two cases of contusio and 1 of vulnus contusum made up the total of injuries for this ship, giving a ratio of $125.0\frac{0}{0}$, and a daily sick rate of $2.50\frac{0}{0}$. The loss of service was 40 days.

INDEPENDENCE.

This ship continued to be employed as the receiving vessel at the Mare Island navy-yard. The zymotic class contained 7 cases of intermittent fever and 1 of remittent fever. The ratio for the class was $88.88\frac{0}{0}$, while that of last year was $66.66\frac{0}{0}$. The loss of service was 69 days, and the daily ratio was $1.33\frac{0}{0}$. Three cases, or $22.22\frac{0}{0}$, were invalided.

There were 10 cases recorded among the constitutional affections, making a ratio of $74.07\frac{0}{0}$, a large falling off from that of last year, which was $222.22\frac{0}{0}$. The loss of service was 28 days, and the daily ratio $.51\frac{0}{0}$. Of the cases recorded, 5, or $37.03\frac{0}{0}$, were invalided to hospital, and 3, or $22.22\frac{0}{0}$, from the service.

Six cases fell under nervous affections, giving a ratio of $44.44\frac{0}{0}$, mostly of neuralgia. The number of sick days was 44, and the daily ratio $.88\frac{0}{0}$. One case of epilepsia was invalided from the service, and 1 of neuralgia to hospital. The total loss of service was 44 days.

The ratio of the diseases of the respiratory system given by 30 cases was $222.22\frac{0}{0}$, which is much larger than that of any other ship on the station, a remarkable circumstance in view of the fact that she has not been exposed to the vicissitudes of a cruising ship. Last year the ratio of these affections was $133.33\frac{0}{0}$. The loss of time from diseases amounted to 211 days, or 7.03 for each case, and the daily average sick rate was $4.22\frac{0}{0}$. Six cases, or $44.44\frac{0}{0}$, were invalided to hospital and 1 from the service.

In the class of diseases of the digestive system, the ratio contributed by 20 cases was $148.14\frac{0}{0}$, as against $111.11\frac{0}{0}$ last year. Ninety days were lost, and the daily sick ratio was $1.76\frac{0}{0}$. One case of ascites and 1 of hernia were invalided to hospital.

Twelve cases of genito-urinary affections were recorded, a ratio of $88.88\frac{0}{0}$ as against $33.33\frac{0}{0}$ last year, showing a large increase in this as in most of the classes. The loss of time was 110 days, and the daily number of sick from these affections was in the ratio of $2.22\frac{0}{0}$. One case of enuresis and 2 of gonorrhœa were invalided to hospital.

By far the largest ratio of skin diseases was also reported by the Independence, 34 cases contributing a ratio of $251.85\frac{0}{0}$. The loss of service was 274 days, and the number sick daily was in the ratio of $5.55\frac{0}{0}$. The invaliding ratio, $88.88\frac{0}{0}$, was caused by 8 cases of scabies and 3 of tinea. It was reported that 7 cases of skin diseases treated were among the survivors of the Rodgers, who suffered from a peculiar parasitic disease contracted from the natives while living in their huts.

Twenty-four cases were noted as resulting from injuries, giving a ratio of $177.77\frac{0}{0}$, as against $155.55\frac{0}{0}$ last year. The loss of service amounted to 178 days, and the average duration of treatment was 74.16 days. The ratio of the daily sick was $3.51\frac{0}{0}$. One case of vulnus laceratum was invalided to hospital.

IROQUOIS.

This ship was commissioned early in the year at Mare Island, from whence she sailed in May for the south. Calling at most of the ports of Mexico and at Panama, she reached Callao in the latter part of the year, remaining there until its close. She was at sea 42 days, and in port 273 days during the year.

In the class of zymotic diseases there were reported from this ship 9 cases of intermittent, 1 each of remittent and typhoid, and 8 of simple continued fevers. The 21 cases reported gave a ratio of $192.66\frac{0}{0}$. The loss of service was 127 days, and the daily ratio of sick was $4.40\frac{0}{0}$, while the average duration of treatment was 6.04 days. All the cases recovered on board.

Dr. George Arthur gives the following notes in regard to the case of typhoid fever reported:

At Callao, Peru, one case of typhoid fever occurred on board which could be distinctly traced to a filthy and badly-drained part of that town. The history of this case was as follows:

Twenty-eight days after exposure to this infection, during which time the patient was languid, irritable, occasionally feverish, and suffered with colic and diarrhœa, he was admitted to the sick list on November 24, at which time the diagnosis was somewhat doubtful. The characteristic symptoms soon developed themselves, however, and corresponded closely with those given characteristic of the prevalent form of typhoid in Callao and Lima, as follows: Ileo-cæcal tenderness and gurgling, well marked and out of proportion to the temperature, which rarely exceeds 105° F., and is generally much lower. Diarrhœa and frequent, hemorrhages from the bowels almost always present. Exhaustion not so great as, and convalescence more rapid than, in true typhoid.

In former years, when the city was even worse drained than at present, and the houses were crowded and squalid, the disease had more of a typhus character, and was extremely malignant and of frequent occurrence, becoming epidemic at times. With the gradual improvement in local hygiene the typhus characteristics of the fever have disappeared, and as above stated it now resembles a mild typhoid.

Twenty-two cases of constitutional diseases yielded a ratio of $201.83\frac{0}{0}$, larger than that of any other ship of the squadron. The cases included 7 of anæmia, 9 of rheumatism, and 5 of syphilis. The resulting loss of service was 185 days, and the daily rate of sick was

6.42 $\frac{0}{0}$. One case of anæmia and 1 of scrofula were invalided to hospital.

Seven cases of nervous diseases were reported, giving a ratio of 64.22 $\frac{0}{0}$, and a daily sick rate of 5.87 $\frac{0}{0}$. The loss of service was 169 days, and the average duration of treatment 24.14 days. Single cases of cephalalgia, convulsio, and neuralgia were invalided.

Of the diseases of the respiratory system there were only 3 cases returned, which were of acute bronchitis, chronic phthisis, and pneumonia, the last two being invalided. The ratio was 27.52 $\frac{0}{0}$ and the loss of time 9 days.

There were 13 cases included among the disorders of the digestive system, giving a ratio of 119.26 $\frac{0}{0}$ and a daily ratio of 3.85 $\frac{0}{0}$. The loss of service was 112 days, the average duration of treatment having been 8.61 days.

The genito-urinary diseases consisted of 2 cases of gonorrhœa, 2 of chancroides, and 2 of colica nephritica, the ratio contributed being 45.57 $\frac{0}{0}$. All recovered after an average duration of 13 days.

Nine cases of integumentary diseases were given in the returns, with the small ratio of 82.56 $\frac{0}{0}$. Two cases of abscessus and 1 of psoriasis were invalided, the ratio being 27.52 $\frac{0}{0}$. The daily ratio was 5.04 $\frac{0}{0}$, and the average loss of service 16.22 days.

The injuries were 27 in number, giving a ratio of 247.70 $\frac{0}{0}$ and a daily sick rate of 3.76 $\frac{0}{0}$. The loss of time was 110 days, and the average duration of treatment 4.07 days; 1 case of fracture was reported to hospital.

The following sanitary report has been furnished by Passed Assistant Surgeon George Arthur:

The Iroquois is a steam corvette of 1,575 tons displacement, built in 1859, since which time no alterations affecting the health and comfort of the officers and crew, excepting the removal of the cabin from the after part of the wardroom to the spar-deck, have been made in her. Her full complement is about 200 officers and men, the accommodations for whom are unusually imperfect.

Ventilation.—The berth-deck is not large enough to furnish swinging billets for all the men quartered thereon, about 20 being obliged to sleep upon the deck. The average air-space, when all the billets are occupied, after subtracting 7 cubic feet for each man and bedding, is about 68 cubic feet, but, as some of the men are always on duty on the spar-deck, this may be increased to about 75 feet in port, and somewhat more at sea, when a greater proportion of the men are on duty on deck or in the fire-room. There are two hatches opening from the berth-deck, one of 4 feet 6 inches by 5 feet 4 inches, the other 5 feet 9 inches by 5 feet 4 inches in size. Besides these hatches, ten air-ports assist in lighting and ventilating this deck, which is consequently gloomy, and, when filled with men, oppressively close. In warm weather, when the ports are closed, the heat and bad air are insupportable, and while under steam off the coast of Mexico and Central America the men were compelled to leave their billets and sleep on the spar-deck, where they were exposed to frequent showers of rain.

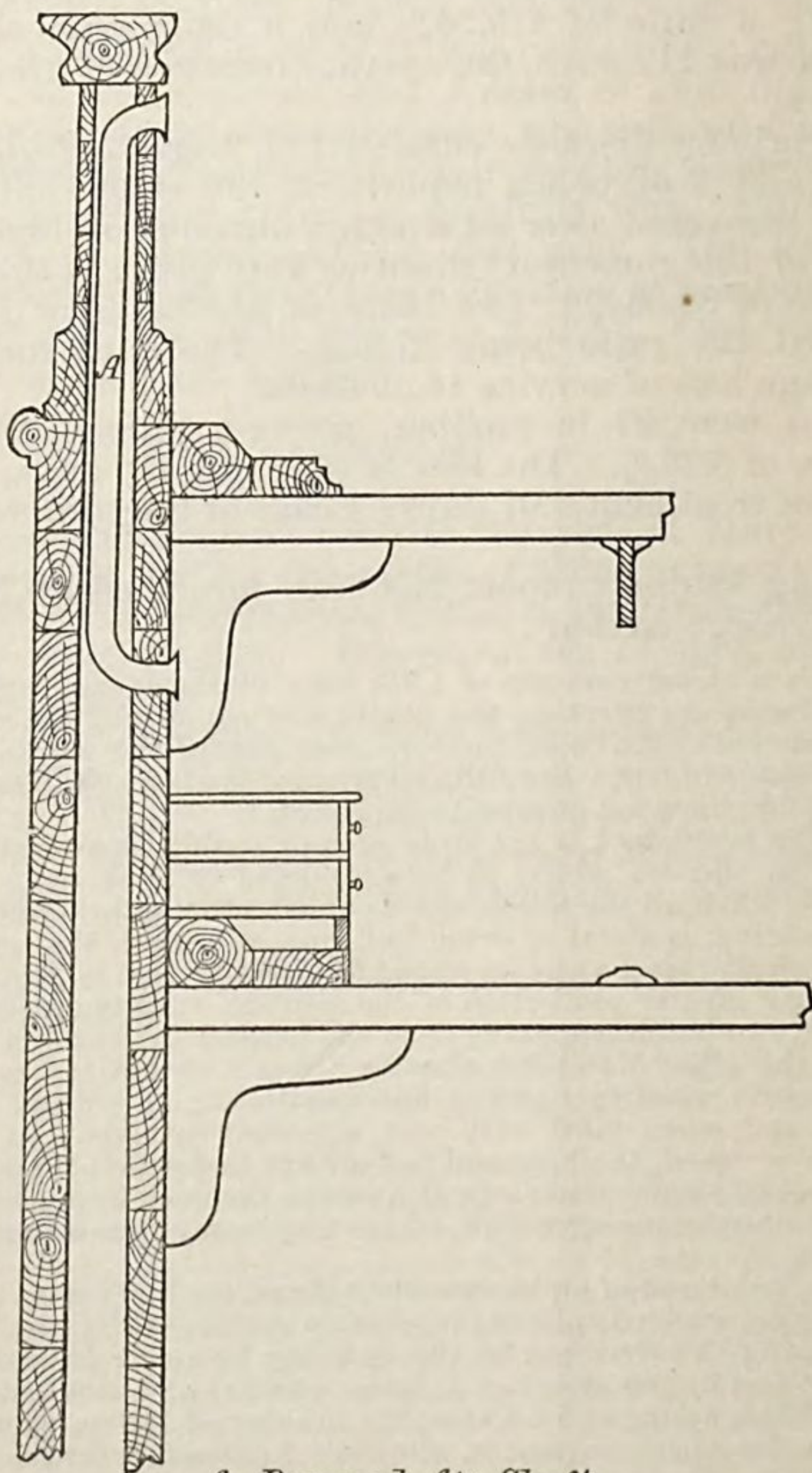
The sick bay is small and of an inconvenient shape, its dimensions being contracted by an anchor engine, which displaces the midship portion of the berth-deck bulkhead forward, diminishing the air-space in the sick bay by about 140 cubic feet, leaving about 1,570 cubic feet in the sick bay proper, exclusive of a small store-room in the forward part. When occupied by 4 men, the number of billets contained in it, the average air-space for each occupant is, allowing 7 cubic feet for each man and hammock, 385 cubic feet. One hatch, 3 feet by 2 feet 6 inches in dimensions, over which is a scuttle in the top-gallant fore-castle deck 3 feet in diameter, and two air-ports dimly light and imperfectly ventilate the sick bay. A wind-sail is kept lowered through the scuttle and hatch whenever necessary. When the ship went into commission the sick bay was provided with a water-closet, which was of very good design, and answered well, until the working of the ship at sea caused so much leakage about the exit of the waste-pipe that it had to be removed, and might be very advantageously replaced by a small earth-closet.

The fore-castle is roomy, and, as usual in this class of ships, well ventilated by six gun-ports, which, excepting in very bad weather, can be kept open. The average air-

space in this part of the ship, when all the billets, 52 in number, are occupied, is about 130 cubic feet.

The officers' quarters, though small, are better ventilated than is usually the case in our men-of-war, the large steerage-hatch, 6 feet 3 inches square, being furnished with a broad stair case running fore and aft, which directs a current of air through the steerage and wardroom to the after wardroom ventilator, whenever a breeze is stirring, a part of which finds its way through the rooms when the air-ports are open. In addition to the steerage-hatch, which aids, as explained above, in ventilating the wardroom, there is a skylight 3 feet in diameter in the forward, a hatch 4 feet 1½ inches by 4 feet 10 inches in size in the middle, and a (pantry) ventilator 2 feet 8 inches by 3 feet 10 inches in size in the after part of the wardroom.

The cubic air space in the wardroom country is 2,304 feet, exclusive of the pantry, which is in the after end of that apartment, giving an average of 292 cubic feet to each



*A. Proposed Air Shaft.
Fig. 1*

of the twelve occupants. The average capacity of the state-rooms in the wardroom is about 163 cubic feet, after allowing for the impedimenta that are usually stowed there. The steerage contains a total air space of 2,145 cubic feet, of which 1,065 is in the steerage country, the remainder being divided between the two steerages proper, giving to each about 540 cubic feet.

The dispensary is large, and reasonably well lighted by an air-port and prismatic

deck light, but as it is placed against the fire-room bulkhead, it is so hot, when the ship is under steam, that many medicines cannot be kept there without injury. No provision is made for ventilating the ship beyond the usual old-fashioned wind-sails, which do not influence the air in the flanks of the ship perceptibly, if at all. The ventilation of all parts of the ship could be greatly improved by means of small air-shafts made of galvanized iron or other material, placed in the frame spaces of the ship between the skins, a space now entirely unutilized, running from the berth-deck, holds, and store-rooms to the spar-deck, and opening under the plank-sheer, inboard, as in the accompanying figure. These air-shafts placed at frequent intervals along the berth-deck, and made as large as the frame spaces would permit, would furnish an outlet for the foul air in the flanks of the ship, when the air-ports were closed. The berth-deck openings should be placed alternately high and low, so as to distribute the air currents as evenly as possible.

Experiments made in the *Vandalia*, which are equally applicable to this and other ships unprovided with artificial ventilating machinery, indicate the value of the air-ports as a means of ventilation, and approximately that of the proposed air-shafts, which would, I think, serve as excellent substitutes for them (the air-ports) when they cannot be kept open. The above-mentioned experiments were conducted in one of the best ventilated state-rooms in the wardroom of the *Vandalia*, directly opposite to a large hatch provided with a wind-sail, where the observations could be made more accurately than in the berth-deck.

The result of the observations was to prove that a large proportion of the incoming air was wasted for purposes of ventilation, even when the air-ports were open, and that when these were closed a very small proportion of it reached the occupant of the room.

The difference in the amount of CO_2 in the air of the room under these different conditions, is shown by the results of the two following observations taken as nearly as possible under similar conditions of wind and weather, the air-port being closed in No. 1 and open in No. 2.

No. 1.

	Cubic feet.
Amount of air entering the room per hour	11,016
CO_2 in 10,000 parts of air	19.036

No. 2.

Amount of air entering the room per hour	9,080
CO_2 in 10,000 parts, of air	.640

In both cases the room had been occupied for eight hours, and the air to be tested was taken from behind the bunk.

These observations represent very well the average result of a large number taken under different conditions of the wind, sails, &c. The air space in the state-room was about 260 cubic feet, and it will be seen that in observation No. 1, although the incoming air was largely more than five times in excess of the requirements of good ventilation, only 455 cubic feet of it actually reached the occupant of the bunk per hour,* about .04 of the amount entering the room, the rest following the course indicated in Fig 2, and escaping nearly as pure as when it entered through the wind-sail

* Formula for determining the quantity of air in cubic feet, to keep an apartment at a given degree of purity.

n = number of occupants.
 Q = quantity required.
 a = CO_2 exhaled per hour per man (.686 cubic feet.)
 b = normal purity of air — .0004 (per cent. of CO_2).
 c = proportion of CO_2 found by analysis per cent.

$$\text{then } Q = \frac{na - nac}{c - b}.$$

Take for example the conditions of observation No. 1, in which

$$a = .686 \quad b = .0004 \quad c = .0019036 \quad n = 1$$

$$\text{then } Q = \frac{1 \times .686 - .686 \times 1 \times .0019036}{.0019036 - .0004} = 445.3$$

This formula supposes the air to be originally of the same impurity as when the air to be tested was collected, *i. e.*, after the room had been occupied continuously for eight hours. This was of course not the case, as the air was much purer when the occupant entered than when he left the room, so that, in reality, somewhat less than 455 cubic feet utilized per hour.

as was indicated by the anemometer. In Fig. 3 is shown the course of the air current when the air-port was open, also obtained by means of the anemometer.

These results represent the value of the air-port as a ventilator, and of the proposed air-shafts as well, which would in some measure, at least, supply their places when they are closed.

It is not intended nor expected that this simple contrivance would insure perfect ventilation, nor would it approach in thoroughness the more elaborate means that have already been put into practice in some of our ships-of-war, but it will certainly

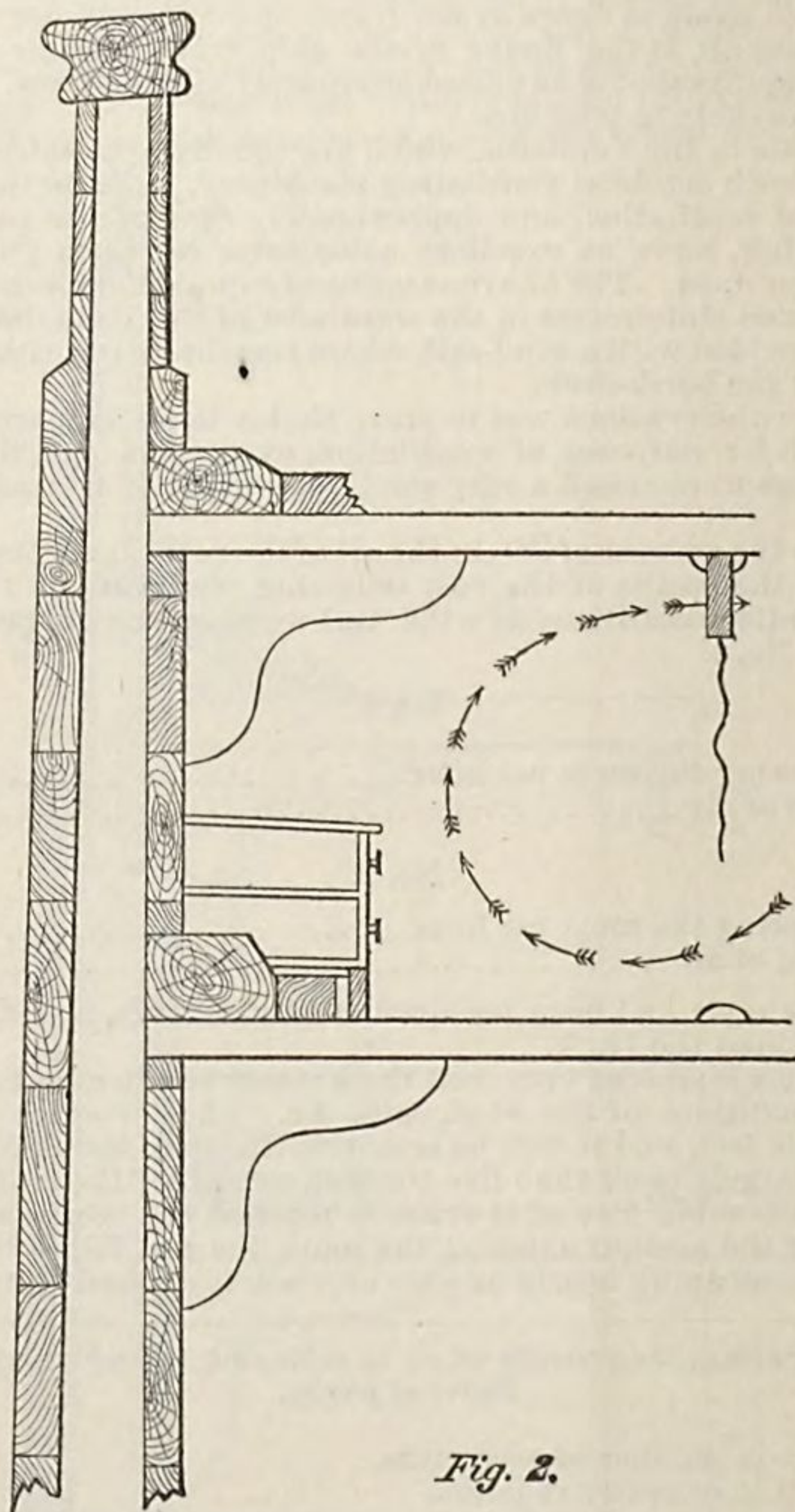


Fig. 2.

be some years before ventilating machinery can or will be introduced generally into the Navy, and, in the mean time, the proposed method would palliate, though it would not entirely remedy, the evils of imperfect ventilation. To make these air-shafts more effective, small exhausting compressed air-injectors might be placed in each of them, the compressed air to be supplied by a steam air-pump in any convenient situation, and to be conducted through pipes passing into the air-shafts, and opening near their spar-deck outlets as in Fig. 4.

The report of the Board of Naval Engineers, ordered to examine and report upon Green's system of ventilation, at the New York navy-yard, on July 30, 1879, shows the great saving in power effected by the use of compressed air-injectors over any other method of ventilation heretofore in use. The objection to Green's system, in which it is intended that the whole apartment shall be ventilated by means of one or two "injectors," placed at the common outlets of several ventilating pipes, and to all other systems of ventilation that I have seen, is the necessity of setting large masses of air

in motion, which always results in irregularity of action in different parts of the area to be ventilated, and great waste of power, expended in producing irregular and useless eddies and local currents of air. To exhaust the air in remote parts of the apartment, through openings at a distance from the point at which the compressed air "injector" is placed, great velocity of the exhausting current is required, while in the plan here proposed the force is so distributed as to act directly at the points where ventilation is required. A much lower pressure in the injectors would therefore be

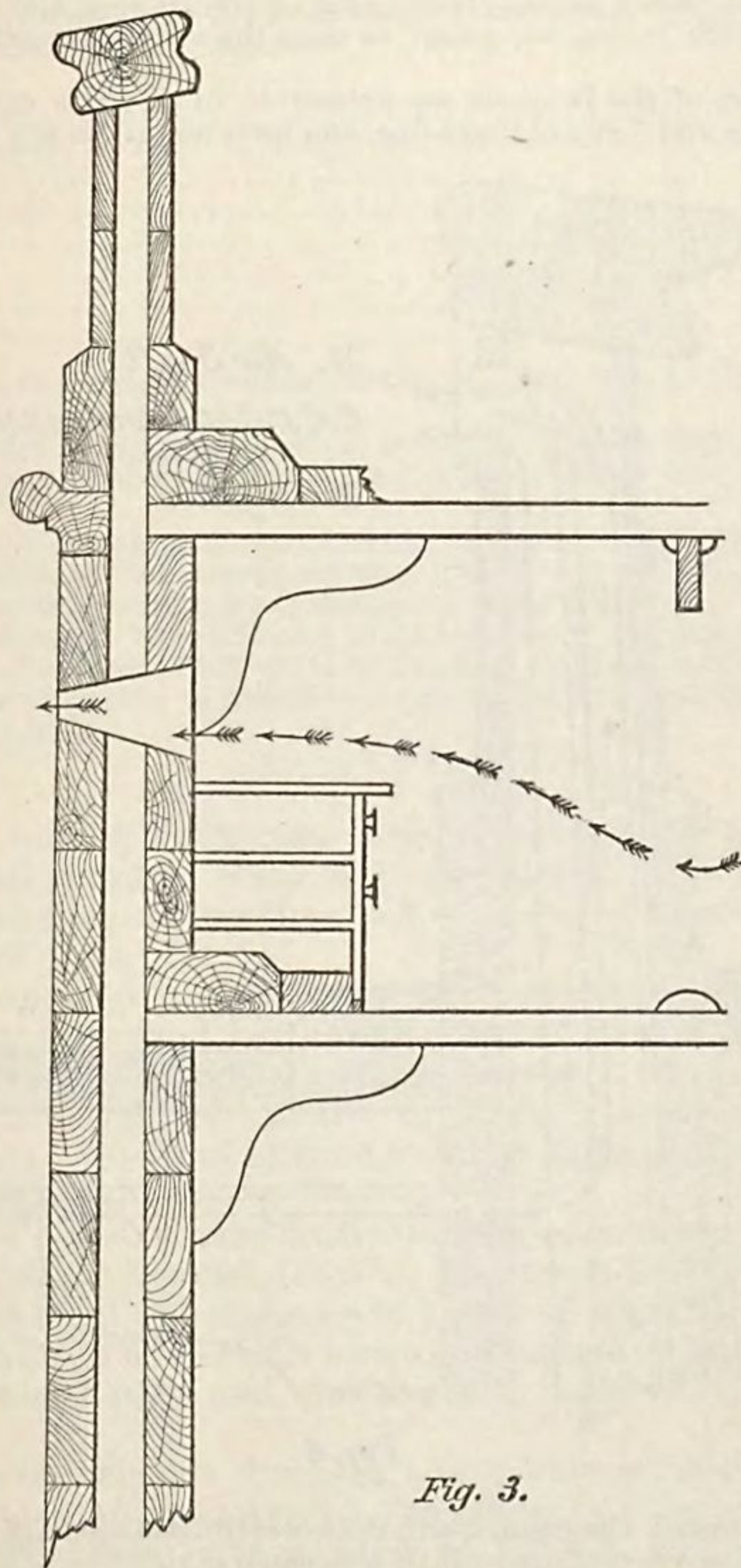


Fig. 3.

necessary, and as the discharging tubes would be short and nearly straight, a greatly reduced amount of friction would be encountered, resulting in a proportionate saving of power. The report of the above-mentioned Board of Naval Engineers, in comparing the "injector" with the Dimfel blower system in use, at present on monitors and other ships, says of the latter: "It is of course possible, with this system, to perfectly ventilate any vessel, so that in absolute efficiency it is equal to the best that could be devised; but economically it is greatly inferior to the system by injectors, requiring a very much greater expenditure of power, and very much bulkier piping."

Of the "injector" system the report continues, "The quantity of atmospheric air to be compressed in the pumps being only from 4 to 5 per centum of what has to pass through the blower, the expenditure of power is proportionately less."

The discharging tubes or air-shafts in which in the plan here proposed the injectors are to be placed, would occupy space now entirely unutilized, namely, that between the skins of the ship in the frame spaces as explained before and the piping leading from the air-pump to the injectors in them, would be insignificant in bulk. Thus the economy of space would be even greater than in the injector system as at present in use.

As the natural tendency of the air forced down through the wind-sails would be to seek an outlet through the air-shafts, the additional exhausting force to insure good ventilation would be very small under ordinary circumstances, and could be increased or diminished from the central air-pump, to meet the varying conditions of wind and weather.

6. *Bilges.*—The bilges of the Iroquois are accessible in all parts excepting under the bread and sail rooms and forward magazine, and have not given any annoyance of con-

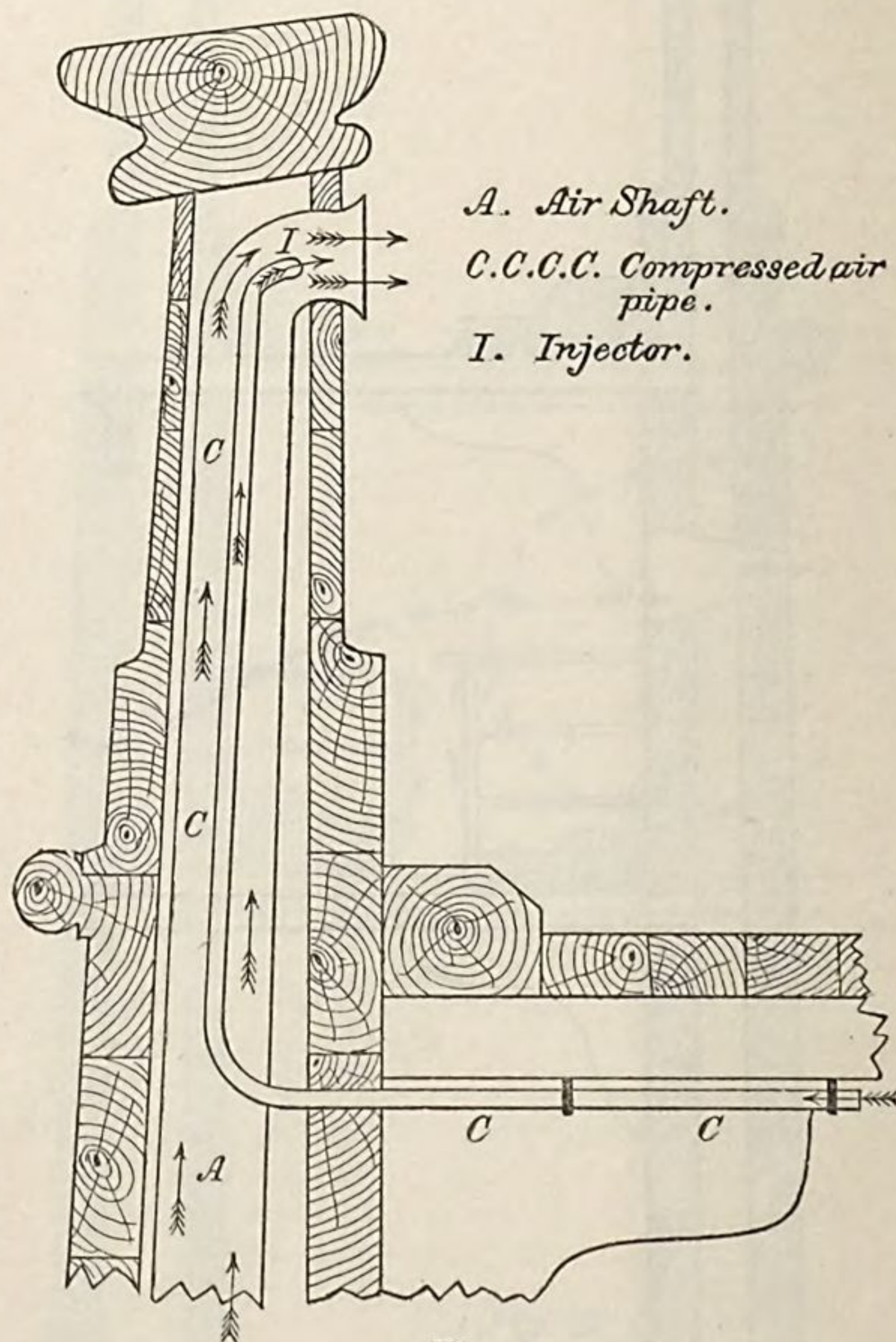


Fig. 4

sequence so far, although the usual berth-deck ventilators opening from them would insure their becoming very offensive if they became foul.

The same objections to the situation of the head, water-closets for the officers, and lack of washing and mess facilities for the crew and servants, that have been pointed out so often in former sanitary reports, apply with full force to the Iroquois.

Some improvement in the messing arrangements of the men might be made by making the lids of their mess chests double, the two pieces to be joined at one end by strong hinges, reinforced if necessary by bolts when in use. These lids could be taken off the chests at meal times, unfolded and swung to hammock hooks, or placed on folding X-shaped iron trestles, fitted into slots cut in their under sides.

In this way tables of sufficient length and width could be kept ready for use, without occupying much room, and these would add greatly to the comfort of the men.

For seats, small three-legged folding stools with canvas seats, such as are used by artists for out-door sketching, and which fold into a very small compass could be

used. For ships' use these seats would have to be made much stronger, and iron might be substituted for wood, as lightness would not be an essential feature when used as suggested.

The water of Callao, in which the tests applicable on board ships failed to discover organic matter or other impurities injurious to health, gave rise to some discussion on the men-of-war in the harbor, and was rejected by all the English and American men-of-war, excepting the Iroquois, as unfit for drinking. An investigation into the matter by the Chilean authorities in Callao proved the water to be very good; the result of an analysis made by the most eminent chemist in Lima is as follows:

One liter of Callao water contains:

	Grains.
Calcium carbonate	.1000
Magnesium carbonate	.0222
Calcium sulphate	.0884
Magnesium sulphate	.0546
Sodium sulphate	.0265
Sodium chloride	.0407
Silicates	.0020
Ferroso-ferric oxide	.0010

The carbonates of lime and magnesium are held in solution in the water by the free carbonic acid which it contains.

This water, which is supplied to ships, is derived from springs, about $2\frac{1}{2}$ miles from Callao, whence it runs through pipes, and is used by the inhabitants generally for drinking water.

The result of this examination satisfied the Chilean authorities, who are extremely careful of the health of their troops, as they find it very difficult to replace any losses by disease or otherwise, of the wholesomeness of the water.

No disease that could be attributed to impure water originated on board the Iroquois while at Callao, from October 11 to January 27, the case of typhoid fever before mentioned being traceable to infection on shore, and no cases of typhoid existed in the hospital at Callao.

LACKAWANNA.

This vessel was at Valparaiso during most of the first quarter, from whence she sailed north as far as Panama, and the whole of remainder of the year was spent along the coast of Peru. She was at sea 76 days, and in port 289 days.

The cases reported under the head of zymotic diseases included 33 of intermittent fever and 1 of erysipelas, the former being the result of previous exposure at Panama and the northern coast. The ratio from 34 cases was $153.84\frac{0}{0}$, as against $154.28\frac{0}{0}$ in 1880, and the daily sick rate was $1.44\frac{0}{0}$. The loss of time was 119 days, and the average duration of treatment 3.5 days.

Thirty-seven cases of constitutional diseases were returned, giving a ratio of $167.42\frac{0}{0}$, as against $158.57\frac{0}{0}$ last year, with a loss of service of 604 days. The total was made up of 1 case of anæmia, 7 of rheumatism, and 29 of syphilis, 3 of the latter being invalided to hospital. The daily ratio of sick was $7.46\frac{0}{0}$, and the average duration of treatment 16.32 days.

In the class of nervous diseases, there were admissions for cephalalgia 1, neuralgia 4, and paralysis 5, the subject of the latter being finally invalided. Two cases gave a ratio of $18.09\frac{0}{0}$, and daily sick rate of $.85\frac{0}{0}$. The number of sick days was 70.

Diseases of the respiratory system occurred in 23 cases, nearly all of which were catarrhal and bronchial, and there were single cases of pleuritis and pneumonia. The ratio was $104.07\frac{0}{0}$, and the daily sick rate was $1.62\frac{0}{0}$. There were 132 sick days, and all the cases recovered, after an average duration of 5.73 days.

Fifty-six cases were entered among diseases of the digestive system, giving a case ratio of $253.39\frac{0}{0}$, and a daily sick rate of $4.20\frac{0}{0}$. The number of days lost from these affections was 342, an average per case of 6.10 days. There was 1 death from dysentery acuta.

Diseases of the genito-urinary organs numbered 18, the ratio being $81.44\frac{0}{0}$, as against $51.40\frac{0}{0}$ last year. The time lost was 153 days, and the daily average ratio of sick was $1.85\frac{0}{0}$, while the average duration was 8.5 days.

Diseases of the skin were noted in 21 cases, and the admission ratio was $95.02\frac{0}{0}$, as against $154.19\frac{0}{0}$ last year, attended with a loss of service of 114 days, or 5.42 days for each case. The daily ratio of sick was $1.40\frac{0}{0}$, and there was no invaliding.

The number of injuries returned was 47, which gives a ratio of $212.66\frac{0}{0}$, a very large increase over that of last year, which was $75.70\frac{0}{0}$. The number of sick days was 393, and the daily average number of sick was $4.84\frac{0}{0}$. Recovery took place in all the cases, after an average duration of treatment of 8.36 days.

In the report made by Surgeon C. H. White, he remarks as follows:

The health of the officers and men has been good, except for a short time in Valparaiso, during the month of January, when we had 32 cases of dysentery and diarrhœa, several of the former being quite serious, one resulting fatally. The cause of the epidemic, as near as I could determine, was the drinking of shore water, which by some mistake had been received on board as potable. This water was the same as that drunk on shore by the inhabitants with impunity, or, if not with impunity, although without producing the violent disturbance it did here. An examination of this water showed the presence of organic matter in small quantity, and a hardness of 14° , Clark's scale. The hardness was chiefly due to the sulphates. This is the only occasion on which shore water has been used for drinking purposes on board, though for cooking and washing we have taken it in nearly every port we have visited.

Two officers and 6 men have been invalided to the United States. Of these cases, 3 were of syphilis, 3 of diseases of the circulatory apparatus, 1 of retinitis, 1 of rheumatism, and 1 of paralysis. Fifty-six men have been enlisted to supply the places that have been made vacant by desertions, expiration of enlistment, and sickness. At present, there is an abundance of fairly good men on this coast who are out of employment and desirous to ship in the United States Navy.

During the year, liberty has been given the men frequently, and the results are manifested in the number of sick days arising from venereal diseases. Of the 2,221 sick days for 1882, 801, or 36 per cent., were due to syphilis and gonorrhœa and its sequæ. Besides these cases that have caused loss of service, there have been 33 cases of venereal sores and 35 of gonorrhœa, which have been so mild as not to require the benefits of a relief from duty for their cure.

At the present time, the coast cities of Peru and Chili undoubtedly have more venereal disease than would under ordinary circumstances fall to their lot. The war, which has now been going on for nearly four years, has demoralized both countries to a greater or less extent, and the military occupation of the Peruvian cities and towns, and the presence of returned soldiers in Chili, have spread widely those diseases that flourish best in camps and uncleanness. The common people on the whole of the west coast of South America are uncleanly in their persons and habits, and from what I can learn, they allow the venereal troubles they may have to run their courses uninterrupted by medical interference of any kind. The medical attendance on the common soldier in barracks and in the field is far from what it should be, and is due to the organization of the medical department rather than to individual negligence or inefficiency.

M'ARTHUR.

This vessel was employed on Coast Survey duty during the year, at San Francisco and other ports along the Californian coast.

In the zymotic class there were 3 cases reported, with the ratio of $93.75\frac{0}{0}$, 1 case of morbilli being invalided. In the nervous, respiratory, and digestive classes single cases were returned, as well as one of violence. The ratio in each case was $31.25\frac{0}{0}$.

ONWARD.

The storeship Onward remained during the year at Callao. There was, therefore, a continued exposure to malarial influences, and the

U. S. S. Pensacola

W. K. Schofield

Surgeon.*

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											400	24.3	20	0	29	Batavia to 9 Batavia from 20
February											400	23	18.3	0	28	Batavia to 13 Talcabana 15 to 17 Loota 19 Loquimbo from 25
March											400	25	22	1	31	Loquimbo 192 Caldera 495 Iquique 12 to 14 Arica 12 to 14 Batavia from 19
April											394	22.6	19.3	0	4	Batavia
May											394	22.1	18.5	0	3	Batavia to 25th
June											394	22.3	17	0	4	Batavia to 27
July											390	28.6	26.3	0	17	Panama from 11
August											390	26.3	24	0	4	Panama to 13 Panama from 20
September											390	22	17.6	0	11	Batavia from 5
October											382	22.3	17	0	13	Batavia
November											382	23.3	19.6	0	12	do.
December											382	25.6	22	0	15	Batavia to 14 Panama from 28

* L. B. Baldwin, P.A. Surgeon last quarter.

zymotic class contributed the large ratio of $162.16\frac{0}{0}$, as against 189.18 last year. The cases were 6 in number, and the loss of service 20 days. The cases were chiefly of intermittent fever.

Constitutional diseases gave also a large ratio, $189.18\frac{0}{0}$, very nearly the same as that of last year, which was $187.18\frac{0}{0}$. The largest factor of this class was syphilis, and 1 case of anæmia was invalided. The loss of service was 180 days, and the daily ratio of sick was $13.24\frac{0}{0}$.

There were no nervous diseases, and but 1 case of bronchitis in the respiratory affections. In the class of disorders of the digestive system occurred a case of hæmorrhoids invalided, and 1 of peritonitis, which recovered. The ratio in this class was $54.05\frac{0}{0}$.

Three cases of chancroides and 1 of gonorrhœa made the total of the diseases of the genito-urinary system, giving a ratio of $168.10\frac{0}{0}$, and a daily sick rate of $2.16\frac{0}{0}$, with an average loss of 7.5 days.

There were 3 cases of violence, 2 of contused wounds, and 1 of abrasion, with a ratio of $81.08\frac{0}{0}$, precisely the same as last year. The loss of time was 24 days, and the daily average sick rate $1.62\frac{0}{0}$.

PENSACOLA.

The flag-ship of the Pacific Station served during the year along the coast of South America, cruising from Panama to Valparaiso, but spending most of the time at Callao, Peru. She was in port 268 days during the year, and 97 at sea.

The zymotic class of diseases included 16 cases of intermittent, 3 of remittent, and 1 each of typhoid and simple continued fever and febricula. The ratio produced was the moderate one of $56.41\frac{0}{0}$, as against $115.52\frac{0}{0}$ last year. The daily sick rate was $1.35\frac{0}{0}$, and the number of sick days 196. The average duration of treatment was 8.90 days. There was one death from typhoid fever.

There were returned 65 cases of constitutional diseases, giving a ratio of $166.66\frac{0}{0}$, as against $112.48\frac{0}{0}$ last year. The cases reported were chiefly of syphilis and rheumatism, 39 of the former and 18 of the latter. The number sick daily from these affections gave a ratio of $6.07\frac{0}{0}$, and the total loss of service was 866 days, the average duration of treatment 6.75 days. Two cases of secondary syphilis were invalided to hospital.

The nervous affections were represented by 18 cases, and a ratio of $46.15\frac{0}{0}$, while the ratio of daily sick was $84\frac{0}{0}$. The loss of time was equal to 122 days, or $6.77\frac{0}{0}$ for each case. One case of meningitis proved fatal, and 1 case of melancholia was invalided to hospital, the ratio in each case being $2.56\frac{0}{0}$.

The ratio given by 40 cases of respiratory diseases was $162.56\frac{0}{0}$, and the daily sick rate $2.79\frac{0}{0}$.

Four hundred days of service were lost, the average duration of treatment being 10 days. One case of pneumonia was fatal, and 1 of laryngitis was invalided to hospital, with the ratio of $2.56\frac{0}{0}$.

Diseases of the digestive system contributed 34 cases, and a ratio of $87.17\frac{0}{0}$, as against $176.05\frac{0}{0}$ last year, a very marked diminution. The loss of time was 130 days, and the daily sick rate $.89\frac{0}{0}$. One case of icterus was invalided to hospital.

The genito-urinary class yielded 27 cases, and a ratio of admissions of $69.23\frac{0}{0}$ as against $65.72\frac{0}{0}$ last year, and the ratio of the sick per day was $2.25\frac{0}{0}$. The loss of time was 323 days, or 11.96 for each case.

There were but 10 cases of skin diseases, and the ratio was $25.64\frac{0}{0}$,

as against $89.20\frac{0}{0}$ last year, showing a very marked reduction. The loss of time was 102 days, and the average duration of treatment 10.2 days.

The falling off under the class of diseases from injury was also marked, the ratio for 1881 being $281.69\frac{0}{0}$, while for the year 1882 it was but $156.41\frac{0}{0}$. The daily sick rate was $4.30\frac{0}{0}$, and the loss of service 616 days. But 1 case, which was of fracture, was invalided, and the average duration of treatment was 10.09 days.

RANGER.

The Ranger was employed during the year in prosecuting the survey of the west coast of Mexico, with the exception of a few months spent in repairing at the Mare Island navy-yard.

The continued exposure to the malarious climate of the coast of Mexico produced the natural result of the development of a large number of cases in the zymotic class, in which were included returns of 38 cases of intermittent and 16 of remittent fevers. There were in all 56 admissions, giving the very large ratio of $430.76\frac{0}{0}$, more than double that of any other ship, and a very large increase over that of last year, which was $234.04\frac{0}{0}$. The daily average sick rate was $6.0\frac{0}{0}$, and the total loss of service was 285 days, giving an average duration of treatment of 5.08 days. Three cases of remittent fever, or $23.08\frac{0}{0}$, were invalided to hospital.

The constitutional affections were represented by 20 cases, and a ratio of $152.84\frac{0}{0}$, as against $170.21\frac{0}{0}$ last year. The resulting loss of service was 135 days, and the daily sick rate averaged $2.76\frac{0}{0}$. Two cases of anæmia, 2 of rheumatism, and 1 of syphilis were invalided, giving a ratio of $38.46\frac{0}{0}$.

Nervous affections were returned in a ratio of $61.53\frac{0}{0}$, given by 8 cases. The daily rate was $.53\frac{0}{0}$, and the loss of service was 27 days.

The respiratory class of diseases included 5 cases of catarrhus, 1 of hæmoptysis, and 2 of phthisis, both of the latter being invalided. The admission ratio was $61.53\frac{0}{0}$, the daily average ratio $.76\frac{0}{0}$, and the total loss of service 38 days. The invalided to hospital and from the service were each in the ratio of $7.69\frac{0}{0}$.

Diseases of the digestive system occurred in 16 cases, the ratio being $123.06\frac{0}{0}$, as against $106.38\frac{0}{0}$ last year. The daily sick rate was $1.23\frac{0}{0}$, and the loss of service 59 days. Single cases of dysentery and dyspepsia were invalided, the ratio being $15.38\frac{0}{0}$.

There were 9 cases of diseases of the genito-urinary organs, or $69.23\frac{0}{0}$, as against $78.01\frac{0}{0}$ in 1881. The number of sick days was 129, the average duration being 14.23 days. There was no invaliding.

Integumentary diseases were also noted in considerable frequency, the ratio being $153.84\frac{0}{0}$, as against $92.19\frac{0}{0}$ last year, and contributed by 20 cases. The average ratio of sick daily was $2.53\frac{0}{0}$, and a total loss of service 123 days.

Twenty-eight cases of injuries were reported, a ratio of $215.37\frac{0}{0}$, also a considerable increase over last year's ratio, which was $127.65\frac{0}{0}$. The average number sick daily was $244\frac{0}{0}$, and the average duration of treatment was 8.71 days. There was no invaliding.

The sanitary report of Passed Assistant Surgeon C. H. H. Hall contains the following notes :

In my last report the impurity of the water distilled on board was alluded to. This defect became the cause of much discomfort before the return to Mare Island in June. Upon our arrival, the matter was reported to the commanding officer, and in consequence of my report upon the bad quality of the water the iron pipes that connected

the water from the condenser to the tanks in the hold, and which had become foul with accumulated oil, was replaced by another which leads along the berth-deck. This will serve until it also becomes foul and begins to give up oil to the water, for the supply of the latter is still furnished by the working steam through the boilers. A movable tin pipe has replaced the old leather hose in conducting the water from the leading pipe to the tanks. An improvised filter, consisting of an iron fire-room bucket, nearly filled with sand, previously washed and heated, receives the water from the tin pipe. Much of the saline matter and nearly all of the free oil and fatty acid odor are removed by this filter, the perforated bottom of which rests upon the margin of the manhole of the tank. There is therefore some reason to hope for potable water in the scuttle-butt as well as on the tables of the officers, when a donkey boiler and a well-constructed filter shall become parts of the equipment of every vessel in commission.

In addition to the alteration of the distilling apparatus, the other changes to be mentioned are the fitting of new deck-plate ventilators for the berth-deck in place of the temporary ones mentioned in my last report, and the introduction of a steam capstan. The ventilators are neatly made of copper, somewhat exceed in diameter that of the deck-plates, and are about 4 feet high. They are firmly secured upon water-tight gaskets, but are easily shifted when the shutes are to be shipped for coaling. They are now the main means of ventilating the after part of the berth-deck while in port, and by acting in conjunction with the fire-room door when the vessel is under steam, they secure for that part of the ship a respirable atmosphere at sea. The capstan occupies about 150 cubic feet of the berth-deck between the sick-bay and the fore-hatch, and is connected with the boilers by a covered steam-pipe, which leads along the beams on the starboard side of the deck. This apparatus is noisy while in action, but adds little to the temperature of the deck, and if arrangements now under consideration can be effected, it will more than compensate for the space it occupies, by doing the work of hoisting the boats, as well as the anchor, thereby permitting a reduction of the deck crew and a corresponding increase of air space to each sleeper below.

In my last report, I referred to the probable aid to ventilation to be derived from use of the door in the fire-room bulkhead. During the past year, numerous observations under varying conditions have shown that it may be made a valuable means of extracting air from the deck. When one fire or more is spread in the fire-room, the current is very light, intermittent, and to and fro, and the incoming current sometimes brings an odor from the fire-room; when there are two fires the draft is light but steady from the deck into the fire-room, and as the number of fires is increased, the draft gains force until with six fires spread a lighted candle held anywhere in the doorway is extinguished. I have accordingly recommended that this door be kept open when two or more fires are spread, otherwise that it be closed. It seems to me that the inequality of ventilation on board ship is not as fully noted as it should be. General contamination of the air, owing to insufficient renewal, is remarked upon as often as the subject of ventilation is broached, and the foul air that lurks in the corners of otherwise ventilated decks does not escape notice; but less frequent allusion is made to the morbid and often more bluntly disagreeable currents that pour down every opening in the deck when the vessel is in a region of low temperature. In the present state of ventilation of nearly all of our vessels either those who sleep near the openings in the dock must shiver in the rain or cold, or those farther away must smother in "funk" when the hatch-hoods are on.

In the etiology of phthisis on board ship a great influence is assigned to foul air, to deficiency of ventilation, while but little is said of the irregularity of it, of the cold drafts that cause catarrhal affections in the sleepers exposed to them. Yet when cases of phthisis are under consideration by boards of medical survey, their catarrhal origin is commonly claimed by the patients, and almost as frequently admitted by the examiners. Among the benefits to be realized by the introduction of appliances for artificial ventilation, a steady change equable in all parts of the deck, under varying circumstances, seems scarcely less important than renewal of the air.

As related to the subject of ventilation, I mention here the use of whitewash instead of white paint on the interior of the berth-deck. During the past year the sick-bay has been whitewashed once a week, either wholly or in parts, with results so satisfactory that the similar treatment of the entire berth-deck is under consideration. In the matter of light and cleanliness the improvement is marked, while there is good reason to think that a depurating effect upon the air is added. On two occasions when the air of the ship's prison became so foul as to require the removal of the prisoner confined there, the air smelling like a kennel, the place was washed with water, and then lime, to which solution of chlorinated soda had been added; two hours later there was no perceptible animal odor, and a week later it was barely sensible, although the cell had been constantly occupied for six days previously. The wardroom pantry has been similarly treated, and with gratifying results.

The application of a coat of whitewash every Saturday to the berth-deck would

require no more time and labor than the weekly scrubbing which the beams and ceiling now receive, and would add no more to the humidity of the deck, while the gain in light, cheerfulness, and probably disinfection of the deck would be great. After a week's exposure the lime on the ceiling commonly becomes powdery like an efflorescent salt, and the superficial layer is thus easily removed with a stiff broom, and a smooth clean surface upon which to apply a fresh coat is exposed. The addition of a little salt to the whitewash makes it sufficiently adhesive, without impairing its disinfecting properties, as mucilage would probably do.

I inadvertently omitted from my last report the location of the prison and the galley. The latter is placed advantageously under the break of the fore-castle, where it is sufficiently protected, while the exhalations from the cooking have free outlet into the open air. The prison is built around the foremast, on the berth-deck. This location is a step, but only a short one, in the direction of a fit place for the confinement so commonly awarded as a punishment on board the vessels of the Navy. In this instance the improvement stopped short there, for the 211 cubic feet are inclosed almost wholly by close bulkheads. On opposite sides are two openings each about 18 by 20 inches, and in the upper third of the bulkheads, but they are covered by stout iron bars and iron plates perforated on the port side by 389, on the starboard side by 426 holes, each .75 inch in diameter. But notwithstanding that each inch of these plates is thus perforated by a $\frac{3}{4}$ -inch hole, what was said above of the foul state of the air of the prison while occupied, sufficiently demonstrates the unfitness of this compartment, and its unsafeness for the incarceration of men in a state of alcoholic intoxication. The ventilation could be much improved, without defeating the purpose of the prison by quadrupling the number of the plates, and making them reach from deck to deck. The prisoner would still be deprived of everything but fresh air, or, rather I should say, *changed* air, which is in no measure a synonym in this instance.

The meteorology of the ship is exhibited in the following summary, to which is added, for comparison, the average for the last eight months of 1881:

Month.	Spar-deck temperature.	Berth-deck temperature.	Spar-deck humidity.	Berth-deck humidity.	Average number of ship's company.	Daily sick, excluding injuries.	Daily sick per M., excluding injuries.
1882.	° Fahr.	° Fahr.					
January.....	79	82	73	73	138	6.87	49.8
February.....	74	78	78	77	132	4.60	34.8
March.....	79	82	77	79	130	2.90	22.3
April.....	77	80	73	76	131	3.70	28.2
May.....	78	74	70	74	130	4.60	35.4
June.....	63	68	74	73	115	3.30	28.7
July.....	67	70	71	71	100	1.49	14.9
August.....	67	71	67	71	109	0.74	6.8
September.....	67	73	69	71	132	1.63	12.3
October.....	63	62	74	74	148	1.00	6.7
November.....	75	75	72	72	148	1.96	13.2
December.....	80	86	71	75	148	1.94	13.1
Average.....	72	75	72	74	130	2.89	22.2
1881.....	75	78	72	74	131	2.64	20.4

This merely shows that the ship's company was exposed to a generally high or low temperature and humidity, but fails to exhibit the hourly and daily changes which are probably more important as an influence upon health.

Much has been written against the morbid influence of ship-life, with some stress upon its meteorological element, but the experience of the past two years on board this vessel suggests that too much may sometimes be attributed to that, and that terrene influences may sometimes be neglected, while assigning causes for the sick rate. During this time but a small proportion of the diseases prescribed for has been reasonably ascribable to "domestic" causes, or to the marine climate, while exposure on shore has been obviously accountable for a corresponding excess. The meteorological record testifies to a sufficiently dry internal atmosphere, yet the sick rate has been rather high, the admissions having been in the ratio per annum of $136.3\frac{0}{0}+$, and the total sick rate (which includes those who were prescribed for merely, "outpatients") $328.6\frac{0}{0}+$, since the crew was received on board in March, 1881. In the table given above, it may be seen that the daily sick per thousand during the first half of the year 1882, was exactly treble that of the last half. This great disparity was due in a very large measure to venereal diseases contracted in Acapulco, and to malarial

fevers caused by exposure to the exhalations from the lagoons at Manzanillo, and the operation of these causes was almost confined to the first quarter of the year. As a result of exposure at Manzanillo, the ratio of admissions rose from 67.2 $\frac{0}{0}$ in November to 198.5 $\frac{0}{0}$, in December (1881), and 253.6 $\frac{0}{0}$ in January (1882); and as the effect of this was wearing away exposure to venereal contagion in Acapulco, increased the admissions from 90.9 $\frac{0}{0}$ in February to 115.4 $\frac{0}{0}$ in March, 106.9 $\frac{0}{0}$ in April, 123.1 $\frac{0}{0}$ in May, and 130.4 $\frac{0}{0}$ in June, 1882. During the first half of this year there were 107 admissions and 853 sick days, of which 40 admissions and 223 sick days were for malarial fevers, and 30 admissions with 399 sick days for venereal diseases and affections immediately resulting from them; during the last half, however, there were only 73 admissions, and 448 sick days, of which, 14 admissions and 46 sick days were malarial, and 2 admissions with 26 sick days venereal. Thus, of 107 admissions during the first half of the year, 70, or 65 per cent. were due to malarial or venereal affections, and of 853 sick days, 622, or 73 per cent. resulted from these diseases. These figures prove the preponderance of these two classes of disease during the first half of the year, and if to these two were added the classes of violent diseases, the poisons and the goodly proportion of the others, which was due to exposure before enlistment, but a small number would remain to illustrate a morbid influence in the ship's atmosphere. On board the *Ranger*, unwholesome food, impure water, and unnecessary exposure to easily avoidable influences, were responsible for a large part of the sick days, by causing a depression of the vital forces; but those causes are not chargeable to the ship's atmosphere.

WACHUSETT.

This vessel was stationed at Alaska during the entire year, except for a period of about a month, when she visited San Francisco for the purpose of exchanging crews, after which she returned to Sitka.

In the zymotic class of diseases there were reported but 9 cases, of which 6 were febricula. The admission ratio was 53.57 $\frac{0}{0}$, and the total number of sick days was 62.

As was to be expected, the constitutional diseases prevailed to a much larger extent, the ratio given by 28 cases being 166.66 $\frac{0}{0}$. The cases were exclusively of rheumatism and syphilis, 13 of the former and 15 of the latter. The loss of time was 220 days, and the ratio of daily sick was 3.57 $\frac{0}{0}$. Three cases of syphilis and 1 of rheumatism were invalided, making the ratio 23.80 $\frac{0}{0}$.

The group of nervous diseases was represented by 12 cases and a ratio of 71.42 $\frac{0}{0}$, as against 103.82 $\frac{0}{0}$ last year. Two cases or 11.00 $\frac{0}{0}$ were invalided, and the daily sick rate was 2.20 $\frac{0}{0}$. The loss of service amounted to 137 days.

Of diseases of the respiratory system 24 cases were returned, a ratio of 142.84 $\frac{0}{0}$, a very considerable diminution from that of last year, which was 240.43 $\frac{0}{0}$. The loss of service showed a corresponding reduction from 568 last year to 281 for the present. The daily ratio of sick was 4.52 $\frac{0}{0}$, and the average duration of treatment 11.70 days. Four cases were invalided, 23.80 $\frac{0}{0}$; and 1 death from pneumonia occurred.

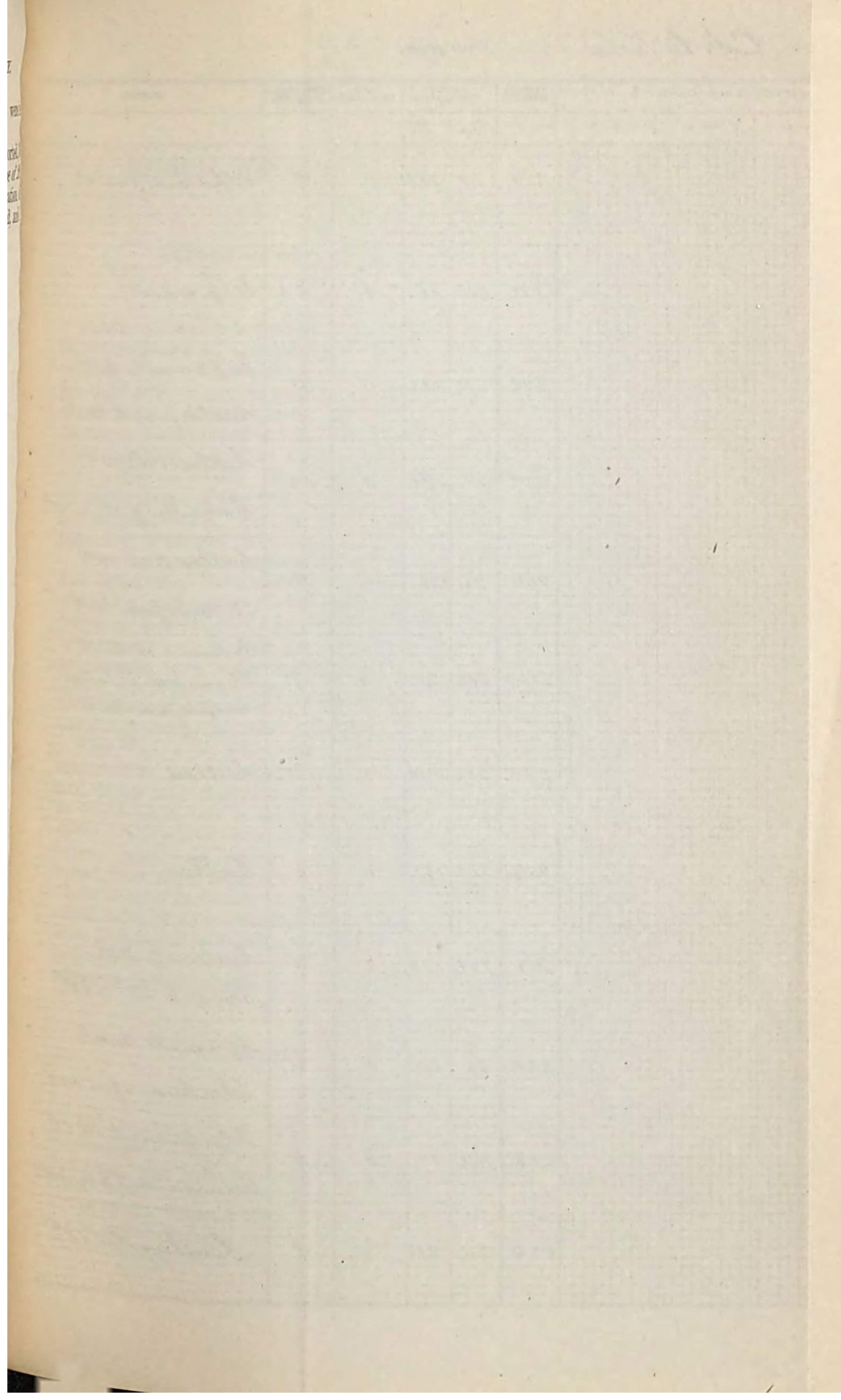
Diseases of the digestive system gave a comparatively small ratio, 71.42 $\frac{0}{0}$, yielded by 12 cases. Last year the ratio was 163.93 $\frac{0}{0}$. The number of sick days was 93, and the daily average sick were in the ratio of 1.48 $\frac{0}{0}$. A single case of chronic dysentery was invalided.

In the class of genito-urinary diseases were recorded 9 cases of gonorrhœa, 2 of orchitis, and 1 of urethral stricture, giving a ratio of 71.42 $\frac{0}{0}$; also there was a large diminution from last year, when it was 863.93 $\frac{0}{0}$. The daily ratio of sick was 3.69 $\frac{0}{0}$, and the total loss of time 190 days. The average duration of treatment was 15.83 days, and there was no invaliding.

The integumentary cases numbered 21, giving a ratio of 125.0 $\frac{0}{0}$ for admission, and 2.20 $\frac{0}{0}$ for the daily sick. The loss of time was 138 days,

and the average duration of treatment 6.57 days. Two cases were invalided, 1 from the service and 1 to hospital.

A large ratio for diseases resulting from violence was reported, 36 cases giving an equivalent of $214.28\frac{0}{0}$, with the loss of service of 282 days. The daily sick rate was $4.58\frac{0}{0}$, and the average duration of treatment $7.83\frac{0}{0}$ days. Two cases, or $11.90\frac{0}{0}$, were invalided, and 1 death occurred from a lacerated wound.



U. S. S. *Lackawanna**C. White*, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January											226	22	18.6	0	9	Valparaiso from 4 th
February											226	21.3	18.	0	8	Valparaiso.
March											226	19.6	18.6	0	9	Valparaiso to 20 th Callao from the 28 th
April											219	21.	19.6	0	10	Callao to the 15 th Coosma River fr 17 th to 29 th
May											216	25.	22.6	0	9	Callao to the 13 th Panama from 21 st
June											214	21.6	20.	0	7	Panama on the 1 st Payta from 8 th to 20 th Callao from the 23 rd
July											223	20.6	16.3	0	8	Callao.
August											228	21.3	16.6	0	8	Callao.
September											218	21.6	17.3	0	9	Callao to 28 th Iquique 29 th to 30 th
October											220	20.	15.	0	8	Iquique to the 4 th Talcahuano from 14 th
November											228	18.6	17	0	7	Talcahuano to the 6 th Valparaiso 9 th to 24 th
December											224	24	21.6	0	9	Callao. 5 th to 13 th

MEDICAL TOPOGRAPHY AND SANITARY REPORTS.

REPORT OF MEDICAL INSPECTOR S. D. KENNEDY.

U. S. FLAG-SHIP HARTFORD.

Punta Arenas is a Chilian convict colony in the Straits of Magellan. It is composed of a number of meanly-built houses, and is laid out in wide streets. There are between 1,200 and 2,000 people, 150 of whom are soldiers. Four regular lines of steamers passing through the Straits touch here. It has increased in numbers, and has become of more importance since steamers have been running through the Straits. Some gold has been found in a river near the colony, and coal in the mountains a few miles off. The climate is cold and damp, and the wind blows strongly most of the year. The principal diseases are pulmonary and throat affections. But few vegetables can be raised, and nearly all supplies are obtained from other places.

The Patagonian Indians come to the colony at certain times to barter the skins they have collected in their hunting expeditions. They are nomadic, and never remain long in one place, as they live entirely by hunting and follow their game over the pampas. Their average height is over six feet, and they are finely formed. They have large heads, low foreheads, eyes wide apart, broad, flat noses, and high cheek-bones. They are copper-colored, but owing to dirt and paint it is often hard to decide what their complexion is. Their intelligence is of a low grade, cunning being the chief characteristic.

The Tierra del Fuegians are still lower in the scale of humanity, and are said to be cannibals. They are often naked in cold weather, and are filthy and disgusting objects. From exposure to smoke, not only in their huts, but in their canoes, they are generally affected with sore eyes. They live upon shell-fish, whale's blubber when they can get it, birds' eggs, and berries. The upper part of their bodies is well developed, but their legs are small and ill-formed from constant sitting in their boats, in which they pass the greater part of their time. Imprisoned within barriers of perpetual storm, mist, snow-covered mountains, and impassable forests, these miserable savages are fair examples of the influence of climate, food, avocation, and scenery upon physical and mental development.

REPORT OF SURGEON C. H. WHITE.

U. S. S. LACKAWANNA.

Talcahuano, Chili.—The report of Medical Inspector H. C. Nelson, as contained in the sanitary and statistical publication of the Bureau for the year 1879, on Talcahuano, Concepcion, and Valparaiso, is very complete. I have obtained a few additional items of information, which I append. Talcahuano has no hospital, but depends on Concepcion, nine miles distant, for hospital advantages.

In *Concepcion* there are two hospitals, or rather one, divided into

two distinct parts. The building devoted to males is of one story, and divided into four wards, each ward being 160 feet long by 26 feet wide. It accommodates, uncomfortably, about 120 patients. The expenses amount to about \$12,000 a year, and are defrayed by interest on endowments, by charity, by paying patients, and by the municipality. The Sisters of Charity have care of everything, and the place is moderately clean. The medical attendants are native physicians, and they bestow very little time on their hospital patients, making only one short visit in the morning. The religious department is more attentive, and service is conducted twice daily in each ward. The food is usually ample in quantity, but of monotonous composition. The usual diet is a farinaceous soup, supplemented in the morning by a cup of coffee, at noon by some potatoes and meat, and at night by a cup of maté.

The building devoted to females is an extension of the above and more recently built. It also has four wards, but they are somewhat smaller than the male wards, and accommodate about 100 patients. The expenses are about the same as for the other building, and are provided for in a like manner.

Just outside of the city there is an old building that was once used for barracks, but getting too dilapidated for such purpose, it was made a pest-house for the shelter of such small-pox patients as have no friends. Its condition is said to be bad.

There is an orphan asylum supported by charity and managed by the "Sisters of Providence," and connected therewith is a day school for poor children that else would go untaught.

A poor-house is provided for the refuge of old men and women who have no means of gaining a living. It is supported by charity partly, and partly by the municipality.

A college, established in 1852, prepares young men to enter on professional studies in the schools of Santiago. It is supported by tuition fees, and by the Government. Connected with it is a library of modest pretensions, a small chemical laboratory, a natural history cabinet, and some philosophical apparatus. There is a seminary for young ladies of the upper class. The curriculum is, to a great extent, of a religious character, but mixed in are a little music and some common-school branches.

Besides the above, there are five convents and a monastery, classed by some as institutes of learning.

They have no poisonous insects or reptiles in this part of Chili except a small spider. It is described as of about the size of our common black spider, and is distinguished by having a bright scarlet spot in the center of its back. Its bite causes great pain and swelling in the bitten part, with nausea, vomiting, and great prostration. Fatal results occasionally occur. The tarantulas are very common, and have all the appearance of those found in Southern California and other parts of the world, but, strange to say, they are utterly harmless. Snakes of several varieties are common, but are not poisonous.

Valparaiso.—The English Hospital, a private institution, is finely situated in beautiful grounds on the hill back of the city, at an elevation of 500 feet above the sea, but difficult of access by a very steep road. The building itself is old and ill adapted to its present purpose. It was formerly a private dwelling, and was made a hospital, with some internal changes in its arrangements, in 1866. It has eight small wards, besides thirteen rooms for single occupants who can afford such luxury. There is no system of drainage, as there is no water to flush the drains. What water they have is from a reservoir filled by winter rains. The

ventilation of the building is made good by the constant winds that sweep over these hills, and the mild climate renders a heating apparatus unnecessary. Seventy patients can be accommodated. In 1881 there were 531 cases treated here, of which 360 were from vessels in the harbor. The death rate, according to the proprietor and administrator of the place, is about 5 per cent.

The German Hospital is situated on the hill near the English Hospital above noticed. It, too, was a private dwelling, and was bought some four years ago by some German residents of Valparaiso, who also direct its management. It is the most pleasant and inviting place of the kind in Valparaiso, and has twenty-seven beds.

The *Hospital de Caridad* is a Chilean institution, under the direction of the Beneficiencia. It is situated at the north end of the city, a large square structure inclosing a spacious court. Different portions of the building have been built at odd times, with little regard for architectural harmony. There are thirteen wards, well lighted and ventilated, and contain, each, from 30 to 60 patients, the total capacity being 640 beds. There are eight medical officers, each combining in himself the attributes of a surgeon and physician for his own wards. There is no alternation in service, but each incumbent remains continuously and indefinitely on duty. There are no house-physicians, and after the regular visit of the morning the place is left in the care of the Sisters of Charity, who keep it neat and watch kindly the sick. In 1881 there were under treatment here 5,164, with 1,157 deaths, or 22 per cent.

It is noticed in the exhibit showing the causes of death that over 52 per cent. of all deaths were from phthisis. I have seen no rational explanation of the prevalence of this disease in this mild and delightful climate, but its ravages are fearful, and unless some preventable cause can be found out, it must result in seriously checking the increase of population throughout the country.

At the commencement of this war between Chili and Peru, a sanitary service, as it was called, furnished medical attendance to the whole army. Surgeons, with their assistants, were sent by this service to each regiment, battalion, or foot, and were in a loose sort of a way attached to such regiment, battalion, &c., being scarcely responsible to the military branch of the service, and were usually too far away to be under the control of the chief of the sanitary service. Neglect of duty on the part of the "sanitary officers," especially in regard to the attendance on the men and non-commissioned officers, as well as in regard to the care of surgical instruments and medical stores, became a subject of complaint to such an extent that, after the battle of Tacna, the whole system was abolished by decree, and a new one organized on what has proved to be a better plan.

The present system, which went into effect November 1, 1880, is distinctly a sanitary commission, entirely of a civil character, and as completely without the control of the military branch as any other civil organization. By the present arrangements there are four ambulance corps and a "flying hospital," and wherever the army moves there follows a portion of this force to wait on the sick and wounded and take full charge of them.

Completely organized, this "sanitary service" is made up as follows: 1 superintendent, 1 assistant superintendent, 1 secretary, 1 statistical clerk, 1 pharmacist-in-chief, 2 assistant pharmacists, 1 purveyor general, 1 assistant purveyor, 1 carpenter, 1 blacksmith, 1 porter. These were attached to the headquarters of the service.

The four ambulance corps have, all told: 4 surgeons-in-chief, 24 sur-

geons of first class, 48 surgeons of second class, 4 pharmacutists of the first class, 20 pharmacutists of the second class, 104 dressers, 4 purveyors, 280 nurses, 19 ambulance and cart drivers, 4 cooks, 8 assistant cooks, 4 washermen, 8 assistant washermen, 4 storekeepers, 4 assistant storekeepers, 4 grooms, 24 servants.

The "flying hospital."—The following is the detail for this service: 1 medical officer-in-chief, 3 surgeons of the second class, 6 dressers, 1 pharmacist, 1 assistant pharmacist, 1 purveyor, 1 steward, 1 cook, 1 washerman, 25 servants.

Two thousand four hundred beds were furnished the four ambulance corps, and 500 to the "flying hospital." Besides these, surgical instruments and appliances were furnished in sufficient quantity to meet ordinary demands, though hardly ample for the severe demands that were shortly to be made. For transportation of material, 24 sumpter mules were given, and for the service of the sick or wounded, 25 other animals—mules or horses—were supplied.

This ambulance and hospital force adopted the rules of the Geneva Convention of 1864, with the distinguishing badge of the *Red Cross*.

By a correspondence in 1879, soon after the breaking out of the war, it was arranged between Chili, Peru, and Bolivia that the Red Cross rules should govern all the contending parties during the present war.

On the 27th October, 1880, the equipped ambulance and hospital force was dispatched from Valparaiso to join the army that was to advance on the capital of Peru. A landing was effected somewhat to the south of Lima, and, finding transportation over the sandy plains very difficult, 500 Chinamen belonging to some of the neighboring plantations were impressed into this service and did good work in carrying material during the march, and afterwards on the field of battle in helping to collect the wounded and to bear them to a place of safety, where such operations as could be done on the field were performed. As the Chilean advance was at no time during the battles of Chorrillos and Miraflores complicated by retreat, and as neither engagement lasted more than three or four hours, the most favorable opportunity possible was offered for collecting the wounded. At the commencement of the battles the whole sanitary force was spread out in the rear of the advancing troops, and detachments of it were sent forward with the columns that charged the Peruvian lines.

The Chilean army that advanced on Lima consisted of 23,129 officers and men. In the battles above mentioned 1,299 were killed, and 4,144 wounded, making a total of 5,443, or 23½ per cent. of the whole invading force.

The dead were disposed of by burning and by burial, that is, those that were disposed of at all; but all the Peruvians and some of the Chileans that fell in the first day's fight in and about the village of San Juan to the south of Chorrillos were left for the vultures and buzzards; at least three weeks after the battle they lay as they fell.

Of the wounded, 2,265 were put on board transports as soon as possible after the battles, and sent south to Valparaiso, a few being left on the way at Iquique, Autofagasta, and Pisagua, where hospitals had been established for the benefit of the army. The mortality among the wounded on the passage south was considerable, but was perhaps more than counterbalanced by the benefits received by the survivors from restoration to their native climate, and from better regimen and care. The remainder of the wounded, 1,879 in number, were put in the hospitals in Lima and Callao, the "Dos de Mayo" alone receiving 750. At the end of January, sixteen days after the battle, the official report

showed that 201 had died out of the 1,879, and 145 had been restored to duty.

The summer and fall, especially the months of February, March, and April, are the most sickly portions of the year in Peru, and, as this season came on, the cases of sickness began to multiply rapidly.

Chosica, on the Oroya Railroad, 25 miles inland from Lima, and elevated nearly 3,000 feet above the sea, had always had a reputation for salubrity, and for this reason was selected as a sanitarium for such of the troops as were suffering from the effects of climate and campaigning. No good results were derived from this change, and, after giving the place a fair trial, it was abandoned as a health resort and only held as a military post. For the more complete occupation of the country, as well as to benefit the health of the soldiers, expeditions to the interior among the mountains were organized. These expeditions were successful in a military point of view at first, but the condition of the soldiers was not improved thereby. At nearly all the stations occupied by Chilean troops, even at Jauja, in the province of Junin, a long-time health resort for Lima, a fever of sad fatality prevailed, which the Chilean surgeons called by various names, sometimes typhus, sometimes pernicious, and sometimes congestive intermittent. At Jauja, the place above mentioned, out of a force of less than 1,000 men, there died 390 from this fever in the course of six months. It is said by the Chileans that the natives suffered to an equal extent with themselves; a fact, if fact it be, for which I am unable to account, unless the disease was genuine typhus.

Strict observance of sanitary laws has been enforced in the city of Lima since its military occupation by Chili. Cleanliness, both within and without the houses, has been compelled by frequent inspections and fines. Fearing an epidemic of small-pox, free vaccination was offered to all in Lima and Callao, and it was ordered that all cases of contagious disease be reported at once to the health officer.

During the prevalence of the yellow fever in the northern ports, quarantine was established in Callao against Trujillo, Eten, Pacasmayo, Huanchaco, and Salaverry. Assistance was given by the authorities to charitable societies, when they had funds which they could lawfully dispose of in this way—such, for instance, as fines and the rents from public buildings; and, by authority from Santiago, a specified quantity of fresh meat and bread was daily distributed to the hospitals and poor. A weekly lottery, for the benefit of charity, was permitted both in Lima and Callao, and the funds accruing were turned to the benefit of the hospitals.

Though Lima has been free from any serious epidemic since its military occupation, the ports to the northward have not been so fortunate. Early in the past year, yellow fever appeared among the Chilean troops which occupied Trujillo and Lambayeque, and spread so rapidly that it was found necessary to divide up and scatter the forces to a distance from these places. Pacasmayo, Salaverry, Mache, and several other places were thus occupied, and usually became new centers for the spread of the pestilence. In Lambayeque there were 371 cases of the fever, out of a force of 743 men, and 137 died—18 per cent. of the whole force. These figures do not include the officers, nearly all of whom had the fever and 8 died. The disease gradually ceased as the cooler weather came and susceptible material was exhausted, and now these places are all reported free from fever.

Guarding her eastern frontier against the Araucanian Indians, Chili has a force of 2,500 men, scattered over a large territory. Medical at-

tendance is furnished by the "sanitary service," as to the rest of the army, but it has been found difficult to obtain competent men, who will put up with the hardships of this frontier life. The disadvantages of a system that cannot compel service, here appear, and it results, that portions of this frontier army are for weeks together without medical aid of any kind.

The following case of strangulated hernia came under my notice, and is presented as possessing interest.

At Arica, Peru, on the 19th day of October, 1880, a Chilean cavalryman was thrown from his horse, the horse falling heavily on him. A left inguinal hernia, as large as four hands could equably compress, was the result. Immediately after the accident, I saw the case with the surgeon of the regiment, and we labored for an hour to reduce the tumor without favorable result. We would have operated at once but there were no instruments to be had. This date, October 19, was just prior to the arrival of the new "sanitary service" with a full supply of instruments and medicines, and this want, which I mention, of the necessary instruments for the operation for strangulated hernia, shows to what straits the previous medical service was reduced before its dissolution.

I went at once on board and got the instruments from the Lackawanna, and, accompanied by Passed Assistant Surgeon Heffenger, returned to the patient who, during my absence, had been vomiting, and now was retching severely, and showing signs of great distress. He was lying on some reeds on the ground in an old adobe house, with no prospect of any better accommodations. Several medical men connected with the army were here assembled, and after making some further effort to reduce the hernia, one of them informed me that, owing to the want of light (night had come on, and we had one tallow candle), they had concluded to defer the operation until morning, requesting me to return in the morning.

I suggested to one of the surgeons present who seemed to take most interest in the affair, that it might be possible to reduce this hernia after aspirating it, and he, after consulting with the others, said there would be no objection to such procedure; and so at their request, I aspirated it, using the finest of the three needles furnished in the naval case. As the result of the operation, we obtained a little over 8 ounces of a blood-stained serous liquid and some intestinal gas. The position of the needle was changed once only during the operation. As soon as there was no further escape of liquid or gas, the needle was withdrawn, and though the tumor seemed to be as large as ever, still, a short effort sufficed to reduce it and relieve the man from his distress. No truss could be obtained, but Dr. Heffenger applied a dressing that secured against any immediate return of the hernia, and we left the case to the care of the surgeon of the regiment. I learned, about a week afterwards, that the hernia had, through carelessness, come down, but had been promptly restored. There was not the slightest evidence of inflammation or irritation in the punctured peritoneum or intestine. Several months afterwards I was told that this man, very soon after the accident, returned to active duty and fought through the Lima campaign at San Juan, Chorrillas, and Miraflores.

At the time I suggested this operation, I was not aware it had been done before for the relief of strangulated hernia. I find, however, that Dieulafoy operated in this way successfully several times. Why it has not been more frequently resorted to in such cases I cannot say, as it seems reasonably to promise well, and, should it fail, there still remains

as before the more formidable operation with the knife unprejudiced by the failure.

The medical department of the Peruvian army, during the late war, was organized on a somewhat different plan from that of their opponents. Over all was a chief, or surgeon general as he might be called; then came a corps of officers corresponding to our brigade surgeon; and below these were regimental surgeons and assistants. The brigade surgeons were thirty in number, but only a part of them were supposed to be present in the field, the others being on hospital duty or subject to emergency calls.

A large ambulance corps, under the ægis of the Red Cross, was organized to assist the regimental medical officers in time of battle. The preparations in the city of Lima for the reception of the wounded were complete. The hospitals were put in order and supplied with everything necessary to meet any call that might be made on them. The Dos de Mayo hospital had accommodations for 800, the Santa Sophia for 400, the San Bartolomé for 600, and the Santa Isabel for 100. Besides these places, many patriotic persons had offered to give up parts of their private residences for the use of such as might be wounded in the coming fight. The old Exposition building was fitted up as a temporary receptacle for the wounded that might arrive by train from the battle field. The ladies of Lima took the greatest interest in everything relating to the hospitals, and lint, bandages, towels, and other articles for the comfort and cure of the sick, were supplied in profusion by private hands. Many of the ladies volunteered their personal services, and Mrs. Piérولا, the wife of the then Dictator, was often seen going about the hospitals and inspecting their arrangements.

The number of killed and wounded on the Peruvian side, in the two fights before Lima, will never be known, even approximately. The army numbered somewhat over 30,000 men, but after the first day's fight no more than 14,000 could be collected for the defense of the second line of intrenchments. Of the 16,000 missing at roll-call, the great majority undoubtedly escaped to their homes in the mountains, whence they had been forcibly taken to fill up the ranks of the army; many were left dead on the field; a few prisoners were taken, and some 50 wounded were reported under the care of the Chilean ambulance surgeons. Besides these, 750, more or less severely wounded, were received by train from the front and put temporarily in the Exposition building above mentioned. As the Peruvians had been driven pell-mell from their intrenchments, and had fallen back 3 miles to their second line, all the more seriously wounded remained with the enemy; and so, the wounds we saw in the Exposition building were, some of them, severe to be sure and even fatal, yet there was scarcely one of such a disabling character as to incapacitate the recipient from making a successful effort at retreat. I did not see a fractured lower extremity among the whole number of wounded, though there may have been a few that were so injured and who were taken away very early by their friends. I can find no record of the more severely wounded that fell into the hands of the Chileans, except of the 50 which I have mentioned above, but which could have formed but a small portion of those unable to retreat.

After the second battle, Miraflores, there was no remnant of the Peruvian army left. Its 14,000 men had disappeared, together with the ambulance corps and the wounded were left to shift for themselves, and had to make the best of their own way into Lima, some 6 miles, or take their chances in the hands of an enemy which they believed lacked wholly the attribute of mercy or humanity.

An officer present at both battles said that the Peruvian Red Cross

ambulance corps was of little use. Its members could be found around the railroad depot ready to take charge of any wounded that were to go to Lima, but he said that he did not remember having seen one individual with the Red Cross, anywhere near where there were fighting and falling men.

There is no record, no writing of any kind that tells of the wounded of this last fight. Lima was in the possession of a mob that held undisputed sway for thirty-six hours, pillaging and burning stores, and killing every one who appeared on the streets. On the third day the victors took possession, and proclaimed a general amnesty to those who remained quiet.

REPORT OF SURGEON M. L. RUTH.

U. S. S. ESSEX.

Santa Cruz, Canary Islands, is a clean, well-built Spanish city of about 5,000 inhabitants. It drains into the sea; its streets are well paved, the houses comfortable, and its people thriving and contented.

There is a civil hospital which is clean and well provided. Back from the sea some 5 or 6 miles, on a plateau surrounded by mountains, and overlooked by the majestic peak of Teneriffe, lies the city of Lagna. It is a quaint and quiet place, remarkable for the evenness of its temperature and the longevity of its people. As a health resort it is in my opinion superior to Funchal.

Porto Praya is a small colonial settlement, inhabited chiefly by negroes. It is built of one-story adobe houses. Its streets are wide and well paved. The water supply comes from the mountains back of the town, and it is plentiful and pure. A new hospital is building which will be modern in its arrangement and ventilation, and when finished will be a credit to the island.

Porto Grande owes its present thrift to its being the coaling station for steamers engaged in the trade between Europe and South America. It is situated at the head of a bay surrounded by high hills. The soil is arid, flowerless, and treeless. Water is obtained by distillation, but is neither palatable nor pure, sufficient care not being taken in its preparation. The town, at the time of our visit, was healthy.

Monrovia, the capital of the republic of Liberia, is a small town of about 4,000 inhabitants. It is well situated on a bluff, and drains on one side into the sea, on the other into a small river. The houses are of frame or brick similar to those of American villages, and are generally surrounded by gardens. The water supply is obtained from cisterns which are kept supplied by the abundant rains. The place is extremely healthy, for although the unacclimated suffer from malarial fevers and dysentery the attacks are generally mild. It has no hospital. The diseases prevalent are generally those of an hereditary nature. The scrofulous diathesis is particularly prominent, as the inhabitants are mostly mulattoes.

New Monrovia are two native villages. The Kroos are well made, strong, intelligent, and honest. Those of the Vijs and Greeboo tribes are fine specimens of physical development. All of these people seemed to be in perfect health.

Sinou, *Bassa*, and *Cape Palmas*, three small villages of Liberia, are pretty and clean places. They are well drained and healthy. In general the sanitary condition of Liberia is good, and its people are virtuous and sober.

At *Sandy Point*, Straits of Magellan, there is a small hospital where in case of need patients may be placed.

REPORT OF PASSED ASSISTANT SURGEON C. H. H. HALL.

U. S. S. RANGER.

Altata, Mexico, is situated upon a low, sandy peninsula and on the right bank of the Culiacan River, the estuary of which forms the harbor of the port. The opposite or left bank is a narrow strip of land, cut up by lagoons, and separates the harbor from the sea. The population of the town, lately about 500, is now nearly 2,000, including a few foreigners, railway employes. The sanitary state is very low, primitive. The water used is drawn from shallow wells dug in the sand, and is always brackish. All the food is brought from a distance, and there is no depot of supplies for shipping. Although the prevailing winds come over the lagoons opposite, there is but little fever among the inhabitants of the port, according to the statement of the mayor of the town, who, in the absence of a medical man, is the most reliable source of information. At the time of the Ranger's visit there were 13 cases of small-pox in the town, the residue of an epidemic imported from Culiacan, in which one foreigner and an unknown number of natives were attacked. The mortality could not be ascertained, but was thought to have been light, probably owing to inoculation, which was reported to have been practiced. During the ship's stay in port, no liberty was granted, but the nature of the duty, a harbor survey, required more or less communication with the town daily, from which, however, no bad results followed.

I learned from an observing railway civil engineer that goitre and cretinism are common at the base of the mountains beyond Culiacan, and that the natives attribute them to the use of the mountain water, impregnated with certain vegetable principles. At the head of the estuary, about 15 miles from Altata, fine edible oysters are found in considerable quantity.

In my report for last year I endeavored to inform the Bureau of the unhealthfulness of the anchorage at Manzanillo by stating the result of a few days' exposure there. That experience led to the selection of Santiago (or Browning) Bay, opposite the town, on the four occasions later when the ship visited that port. No untoward result followed these visits, which aggregated nine days. This anchorage is therefore considered healthful, and greatly preferable to that near the town, while the proximity of the latter, about 4 miles, makes it accessible to a ship's boats.

As prudence forbids a sojourn in the harbor of Manzanillo, so does a regard for the health of the ship's company proscribe all liberty on shore in the port of Acapulco, for that town is grievously burdened with prostitutes, 200 of whom have been discovered to be infected with venereal diseases. As the total estimated population is only 4,000, the danger to the ship's company can easily be computed, or more accurately learned by consulting the medical journals of this and other vessels granting liberty there. Of the 32 cases of venereal disease admitted to the sick list during the past year, 28 originated in Acapulco, and if to these are added the cases of chancroid and gonorrhœa that were merely under treatment, it will be seen that more than 25 per cent. of the ship's company have suffered in this way during the past year. Five of these cases have been sent to hospital, and others on board are breaking down, and soon will be unfit for service. In consequence of this experience, no liberty was given in Acapulco during the ship's visit to that port in November; the result was that the only case of venereal disease

admitted during the fourth quarter was one of orchitis from gonorrhœa contracted just before enlistment, and prior to December 25 no case was under treatment which had originated among the ship's company within six months. Between December 20 and 26, however, general liberty on shore was given in Acapulco, and resulted in 12 new cases of venereal disease, 5 of whom were admitted to the sick list, which, on the 31st January, consisted of seven (two of them old) cases of venereal disease and one of furuncle. Liberty on shore at this port has also been followed by new cases of malarial fever, probably contracted during the all-night exposure. These cases have appeared without fail after general liberty in Acapulco, and have usually proved to be of remittent character. That they were not merely the development of morbid impressions made elsewhere seems to be shown by their outbreak after ten days to two weeks, whereas it should have occurred earlier if due to earlier impressions, to which the debauchery served as an exciting cause. During the ten years from 1870 to 1879 there were in Acapulco 2,436 deaths from all causes, of which 1,414 were due directly to malaria.

To this notice of local influences I add that while the vessel lay in the harbor of Salina Cruz there was frequent complaint of congestive occipital pain by the officers and the men, which was apparently caused by exposure to a "norther," a fresh, very dry wind that frequently blows for several days from the north. This wind is warm (84°), but its dryness (50) and its velocity (8 to 10) gave the impression of a wintry blast. No other disturbance of health appeared to follow exposure, though, contrary to sanitary recommendation, many of the men slept nightly on the open deck in this wind.

No case has been under treatment presenting peculiar features that would merit especial mention, but since the writing of my last report four cases of well-marked herpes zoster have been under treatment. Three of these were cooks (two general and one mess), and the other a dissipated petty officer. All of these cases were conspicuously free from mental worry, which has recently been advanced as one of the nervous causes of this interesting affection. The last of these cases, a Chinese ward-room cook, was unusually severe, for the vesicles formed a half zone on the right side of the chest, the belt passing under the arm; the eruption extended down the axillary side of the arm to the elbow, and in the axilla the vesicles were largest as well as most numerous. In this case ol. menth. pip. was the only dressing, and seemed to give some relief, but the disease ran the usual course of ten days.

ORGANIZATION OF THE CHILIAN ARMY.

The following report on the organization of the Chilian army is presented by Passed Assistant Surgeon George Arthur :

Before the present war between Peru and Bolivia on one side, and Chili on the other, no regularly organized medical corps existed in the Chilian army, physicians employed by contract having attended the small number of troops stationed in her cities and engaged in her Indian wars. When, however, the army was increased at the beginning of the war, which is still in progress, this method of employing surgeons was found to be entirely unsatisfactory, and in September, 1880, a complete organization of the sanitary service was attempted.

As the military authorities of the Chilean army considered that the duties of medical officers were of an entirely non-military character, the new organization was made upon a civil basis; no rank was given to the medical officers, and the entire corps was expressly enjoined by the regulations not to wear uniform or other insignia of military authority.

Previous to the commencement of actual hostilities, the three belligerent Governments of Chili, Peru, and Bolivia agreed to observe the rules of the Geneva Convention, and the sanitary corps of all the combatants were considered as forming a part of the International Society of the Red Cross, and hence completely neutral.

By the order of the general Government which created this "sanitary service," it was divided into the "dirección" or executive department, four ambulances and one flying hospital.

The *personnel* of the executive department, with their monthly pay, was as follows:

One superintendent of the sanitary service	(*)
One assistant superintendent	(*)
One assistant superintendent	\$500
One secretary	200
One statistician	150
One chief pharmacist	250
One purveyor-general	300
One assistant surveyor	100
One carpenter	75
One servant	40

The duties of the superintendent of the sanitary service were as follows: To assume the entire direction of the sanitary service and all its adjuncts; to appoint the employes of the service and remove them, giving reasons therefor to the general Government; to detail the *personnel* and distribute the *matériel* of the service; to make requisitions for whatever medicines and other supplies might be necessary for the sanitary service on the "intendencia jeneral";† to designate in case of absence or temporary inability to perform his duties the officer who should fill his place, reporting his action to the "intendencia jeneral;" to make regulations for, and to arrange the details of, the ambulances and hospitals.

The duties of the remaining officers of the service were not defined by regulation, but were left to the discretion of the superintendent.

The *personnel* of each of the ambulances, with their monthly pay, was established as follows, viz:

One surgeon-major	\$500
Six surgeons of the first class	250
Twelve surgeons of the second class	150
One pharmacist	150
One purveyor	100
Five apothecaries	75
Twenty-six medical cadets (<i>practicantes</i>)	75

In addition to these, 70 servants, besides cooks, laundrymen, drivers, &c., were allowed to each ambulance.

The ambulances were well equipped and provided with their own means of transportation, each one being supplied with 6 wagons, 24 mules with harness, 25 saddle-horses, 25 stretchers, 625 cots with bed clothes, and sufficient mess-gear for all the employés and 600 patients, with portable cooking apparatus on the same scale.

* Both of these officers served without pay.

† The "intendencia jeneral" is the department which has charge of the supplies, equipment, transportation, and pay of the army.

The outfit of the medical cadets was complete and good, containing, besides the ordinary instruments and appliances for minor surgical operations, small portable heating apparatus of excellent design (*caramayolas*), for warming food, coffee, cataplasms, &c.

Each surgeon of the first class was required to have one large general operating case, containing the usual instruments; those of the second class a smaller case.

Besides the above-mentioned instruments, each ambulance had a surgical "arsenal," equipped literally with all the instruments and appliances of modern surgery, the supply of the smaller articles not being limited, excepting by the actual demands of service.

The flying hospital was provided with cots for 500 patients, besides mess-gear, cooking apparatus, and other necessities for that number of patients and its own employés. A surgical arsenal was also provided for the flying hospital, equal in completeness to those of the ambulances.

The regulations did not limit the amount of medicines, which were furnished by the intendencia, through the chief pharmacist, as the exigencies of the service demanded.

The function of the ambulances was to move with the troops, and to establish temporary hospitals at the seat of active operations, where urgent or slight cases could be treated, until removal of the graver ones to the flying hospital was practicable.

The function of the flying hospital was to establish a more permanent hospital in a suitable building or buildings farther from the scene of action.

No provision was made in this scheme for a regimental medical service, surgeons, as well as cadets, dressers, servants, and other attendants, being temporarily detailed from the ambulances to accompany the troops into action and on expeditions, nor for recording and preserving the records of the sanitary service for future compilation and reference. The purveyors and pharmacists were not bonded officers, and were not accountable to the superintendent of the service for the disposition made of the stores under their charge. In short, the entire organization was extremely loose and imperfect, and, as might have been foreseen, utterly failed to satisfy the requirements of the army in the field. So glaring had the defects of the service become, under the test of actual experience, that in November, 1881, little more than a year after its first organization, a complete remodeling of it was regarded by the authorities as the most pressing need of the army.

Don Benavente, the "intendente jeneral," in a communication to the minister of war, dated November 12, 1881, in which he recommended a complete reorganization of the sanitary service of the army, after dwelling at some length on the importance of having that branch of the service in the most efficient possible condition, pointed out the most serious defects of the organization as it existed at that time, and suggested remedies for them. The *personnel* of the existing service, he said in this letter, were entirely inadequate to the duties required of them, both in numbers and fitness, especially in the lower grades, namely, the cadets (*practicantes*), both of medicine and pharmacy, dressers, and other ambulance attendants. The large ambulances had proved to be unwieldy, and unexpected difficulties had been found in detailing portions of them to accompany expeditions, and to attend small bodies of troops acting singly. Instead of these large ambulances of 600 beds each—which had been reduced to three in number, instead of four as at first, in consequence of the number and length of the necessary details of medical officers attached to them to isolated bodies of troops, not large

enough to require an entire ambulance—and of the flying hospital, six smaller ambulances of 200 beds each, and the creation of a regimental medical service (*servicio de cuerpos*), were recommended.

The proposed smaller ambulances would not be too large to accompany expeditions of small bodies of troops, and to attend the smaller posts, and the evils of a more or less sudden and unforeseen division of an organized ambulance, complete in itself, would be avoided.

The want of regular regimental medical officers, attached permanently to the different bodies of troops, was most severely felt during the war, and Don Benavente's recommendation to create such officers was expressed in urgent terms. In the absence of such officers, continued the letter, many cases, which might have been prevented by timely care, did not receive proper attention, until they became pronounced enough to be sent to the ambulances or hospitals. The local hygiene of the regiments and battalions, which the general sanitary regulations for the army did not always entirely cover, would also be provided for by the creation of such a service. The officers of this regimental service would be, moreover, always ready to move with their regiments or battalions, without extraordinary preparation, their outfit being complete, portable, and always ready.

The advantage of a personal knowledge of the individuals composing the regiment or battalion, the value of which is obvious, was also pointed out by Don Benavente, with many other good reasons for establishing the regimental service by regulation, which it is not necessary to dwell on here.

While the dressers, stretcher carriers, and other ambulance attendants were undisciplined civilians, the combatant soldiers, feeling no confidence in their stability under fire, were found to leave the ranks during actual fighting, in large numbers, to assist their wounded comrades to the rear; a duty that should have been performed by the cadets and stretcher carriers. This occurred in some of the battles to such an extent as to seriously diminish the efficiency of the troops engaged, as the assistance of the wounded was made a pretext for wholesale skulking from the ranks.

In the new plan it was proposed that soldiers should be taken from the ranks, and, after special instruction as dressers and nurses, transferred to the sanitary service to fill these positions. These men being disciplined and reliable, with soldierly traditions, continued the letter, the evils resulting from the undisciplined and peaceful habits of the men they replaced would be avoided.

The looseness and incompleteness of the then existing regulations, the inefficiency of the sanitary service resulting therefrom, and the importance of fixing by well-defined rules the duties of the entire *personnel* of the service, were discussed and an outline of the proposed regulations given. The necessity, which the experience of the war forced upon the military authorities, of giving to the medical officers definite rank was recognized, and the bestowal of such rank recommended, the old plan of a purely civilian medical branch of a military service having proved impracticable.

Finally, the letter concluded with a renewed declaration of the necessity of a complete and efficient sanitary service for the army, and a modest hope that, although the new organization proposed by himself might not be perfect, it would at least be found, in practice, to avoid many of the bad features of the old one, and contain many that were new and good.

These suggestions of Don Benavente served as a basis for the follow-

ing general orders (*decretos supremos*) of May 22 and August 10, 1882, establishing the sanitary service substantially as it now exists.

The order of May 22 declares that the sanitary service of the army in the field as established by the general order of September 28, 1880, will be henceforth replaced by ambulance and regimental medical services (*servicio de cuerpos*), but this order does not destroy the power of establishing hospitals* in the absence of existing civil hospitals when it is considered advisable.

The number of beds in the ambulance service, continues the order, shall be in the proportion of 15 to each 100 men of the army in the field (*fuerzas expedicionarias*). Each ambulance shall contain 200 beds, and the number of ambulances which the army shall possess shall be in the above-mentioned proportion.

The general order of August 10, 1882, establishes the *personnel* of the sanitary service, regulates their pay, and defines their duties substantially as follows:

The *personnel* of the sanitary service with their monthly pay shall be as follows, viz:

One chief surgeon of the army	\$400
One secretary	185
One chief pharmacist and storekeeper	250
One assistant to the chief pharmacist	85
One purveyor general	200
One assistant to the purveyor general	115
One statistician	150
Four servants, each	20

PERSONNEL OF THE AMBULANCE SERVICE.

For each ambulance—

One chief surgeon	\$250
One surgeon of the first class	225
One surgeon of the second class	150
Four medical cadets (<i>practicantes</i>)	90
One apothecary (<i>practicante de farmacia</i>)	135
One purveyor	115
Twenty attendants (dressers, nurses, &c.)	20
One steward	25
One cook	30
Two assistant cooks	20
One laundryman	25
Two assistant laundrymen	20
One overseer (<i>capataz</i>)	30
One assistant overseer	20
One hostler	20

PERSONNEL OF THE REGIMENTAL SERVICE.

For each regiment of artillery or infantry:

One surgeon of the first class	\$225
Two surgeons of the second class	150
Four medical cadets	75
Four attendants (dressers and nurses)	20

For each battalion of infantry or regiment of cavalry:

One surgeon of the first class	\$225
Two medical cadets	75
Two attendants	20

All the employés of the service during active operations shall be entitled to the regular ration.

The intendente jeneral is authorized to allow extraordinary compensation to the

* In the original "*hospitales de evacuacion*," which refers to hospitals established at points that the army has left. This and the two following clauses provide for the absence of the flying hospital, abolished by this order.

officers and employés of the service, whenever in his judgment the interests of the Government require it, reporting such action to the general Government.

The medical outfit of each regiment of artillery or infantry shall consist of 3 ambulance chests; * 3 regimental surgical cases; 1 chest of ambulance stores for each surgeon; 12 portable cots; sacks and canteens for the cadets and attendants.

The outfit of each battalion of infantry or regiment of cavalry shall consist of 2 ambulance chests; 2 regimental surgical cases; 1 chest of ambulance stores; 9 portable cots; sacks and canteens for the cadets and attendants.

Each ambulance shall be provided with 2 wagons; 30 mules with pack saddles and 10 without; 9 horses with riding saddles; portable tents for the officers, employés, and 200 sick; 200 portable cots, each with a thin hair mattress; 200 field-beds, each with a mattress, to be used when the ambulance is converted into a field hospital; 20 Wheeler cots; 2 surgical cases; 2 dispensary chests; 2 ambulance supply chests (*cantinas de administracion*); 8 irrigators for dressing wounds; 12 bullet extractors; 2 Nélaton probes; 1 set of cautery irons; 1 ice machine; and bed-clothing, hospital furniture, and mess gear for the employés and 200 patients.

DUTIES OF THE OFFICERS AND MEN.

OF THE CHIEF SURGEON OF THE ARMY.†

He shall have the entire supervision and direction of the sanitary service of the army in the field (*en campaña*), and his duties are—

To maintain the *personnel* of the service, appointing and removing its employés, with the approval of the “intendencia” of the army. With the same limitation, to appoint his successor in case of temporary inability to perform his duties, and to give the officers and men of the service sick leave on certificates of disability signed by any medical officer he may appoint for that purpose.

To detail the members of the service for duty, and to distribute its material as the exigencies of the general service may demand.

To supervise the ambulances, hospitals, and barracks, and make sanitary recommendations when necessary to the officers under whose command they are.

To make a weekly report to the commander-in-chief of the army, of its sanitary condition.

To personally decide, in the case of the superior officers of the army, questions of physical disability and sick leave.

To be present during and after engagements, so as to make the best disposition of the sanitary means at his command.

To make internal regulations for the hospitals and the ambulance and regimental services, making whatever changes he may consider necessary in their *personnel* and supplies, reporting such action to the director of the sanitary service for his approval.

To regulate and supervise the movements of the ambulances in active service, and the transportation of the sick and wounded, and to see that they receive proper attention while being moved. These transfers are to be made with the approval of the commander-in-chief if he is present; if he is not, upon his own authority.

To make a monthly report to the director general of the sanitary condition of the army, a second upon the expenditure of medical and surgical supplies, and a third upon the work of the hospitals and ambulances, based upon data furnished him by their respective chiefs, adding a requisition for whatever may be needed in those departments. At the same time he shall forward to the “intendente jeneral,” or in his absence to his deputy, the monthly account of the purveyor general.

DUTIES OF THE SECRETARY OF THE CHIEF SURGEON.

To carry on the correspondence of the chief surgeon, keeping copies of all letters in a book provided for the purpose.

To furnish the subordinate officers with whatever information and statistics they may require, and to do whatever other duties may be assigned him by the chief surgeon.

OF THE CHIEF PHARMACIST.

He shall reside within easy reach of the chief surgeon of the army, and shall keep account of all medical and surgical supplies received and expended by the sanitary service and remaining on hand.

To keep a separate account of the receipts, expenditures, and supplies remaining on hand, of each ambulance and regiment or battalion.

* For the contents of these chests and cases see appendix.

† Of the army in the field, the director of the sanitary service in Chili is his superior, and the chief of the naval medical service as well.

He shall issue no supplies without the written approval of the chief surgeon upon the requisitions for them.

He is forbidden to dispose of any stores, excepting for the purposes for which they are intended, if he is ordered to do so; and after he has protested in writing, if the order is repeated, he shall obey and report the matter to the intendente general, through the director general of the sanitary service.

He shall present to the chief surgeon, monthly, an itemized account of all receipts and expenditures of stores under his charge during the preceding month, accompanied by all the documents authorizing such issue, which shall be forwarded to the intendente general for his inspection and approval.

He is responsible for the care and preservation of the medical and surgical stores under his charge, giving receipts for all that he receives.

He shall issue to medical officers whatever supplies they may need, upon requisition, subject to the approval of the chief surgeon of the army, and shall see that they are in good condition.

He shall anticipate the demands of the service, and shall always keep a sufficient supply of stores on hand.

He is required to inspect monthly the ambulance chest and surgical cases, and to report monthly to the chief surgeon the manner in which the subordinate apothecaries perform their duties.

To serve in any hospital that the chief surgeon may designate and to execute his orders.

The assistant to the chief pharmacist shall obey the instructions of his superior officer.

OF THE PURVEYOR GENERAL.

The purveyor general shall supervise the expenditures of the ambulances, and shall keep strict account of all the stores issued to and consumed by them, and by the regimental medical officers, with the exception of those strictly medical and surgical, which are under the charge of the chief pharmacist, in the same manner as is prescribed for that officer.

He shall make requisitions upon the intendente general, or, when this is not practicable, upon the proper military authorities for the funds necessary for the ambulance and regimental services, through the chief surgeon of the army.

He shall issue stores to the ambulance purveyors, with the approval of the chief surgeon and the chiefs of the ambulances, and shall require monthly, from each ambulance purveyor, a written statement of accounts for the previous month, approved by the chief of his ambulance.

He is also instructed to present a monthly statement of his own accounts to the chief surgeon of the army, which shall be forwarded to the commissary department of the army through the "intendente jeneral."

To obey all the orders of the chief surgeon of the army.

To precede the army, when on the march, for the purpose of ascertaining the best method of transporting the material of the ambulances.

To make a report to the chief surgeon upon the fiscal affairs of the ambulances, and a monthly report upon the expenses and needs of his branch of the service.

The assistant to the controller general is instructed to obey the orders of that officer.

DUTIES OF THE STATISTICIAN.

The statistician shall have under his charge the compilation of the medico-chirurgical statistics of the army, and his duties are—

To compile into general reports, according to the prescribed forms, the weekly and monthly reports of sick of the surgeon of the ambulances and regiments, which general reports he shall keep on file in his office, and to send copies of these reports, together with the reports of the ambulance and regimental surgeons, and whatever other information he may ask for, to the chief surgeon of the army.

To see that all medical officers are kept supplied with blank forms, and that these forms conform to the regulations.

REGULATIONS FOR THE AMBULANCES.

The ambulances in active service shall carry on their duties in their own tents or buildings, but when stationed in cities or towns shall occupy such hospitals, when they exist, as the chief surgeon of the army may direct.

DUTIES OF THE AMBULANCE SURGEONS.

Of the chief of an ambulance.

To have command of his ambulance, and to make such disposition of it as the chief surgeon may direct.

To distribute the duties of the ambulance amongst his subordinates.

To make monthly reports to the chief surgeon upon the work performed by the ambulance or hospital under his charge, according to the prescribed forms, sending with them the bed tickets (*papeletas de cama*, see appendix) from which the reports are compiled.

To approve and forward the accounts of his pharmacist and purveyor.

DUTIES OF THE SUBORDINATE SURGEONS OF AMBULANCES.

These officers are instructed not to attempt serious operations on the field of battle, limiting their services to the most urgent indications; stopping hemorrhage, closing penetrating and gaping wounds, putting shattered or fractured limbs into temporary splints, extracting foreign bodies, &c.

To reserve the serious operations for the ambulance, taking note of the "ticket" attached to the wounded by the regimental surgeons. To consult with each other in the most important cases, and in case of disagreement to refer the matter to other surgeons, or to the chief surgeon of the army. (*Sic.*)

To visit the cases under their charge every morning, to attend personally the serious ones, and visit them in the evening as well, at which time they shall make an inspection of their wards, taking notes of the occurrences of the day.

DUTIES OF AMBULANCE PURVEYORS.

The purveyors of the ambulances will have charge of the pay, commissary, and quartermaster's departments of the ambulances.

They will be held responsible for the stores in their departments, and will keep and send to the purveyor general their accounts, as already ordered in the instructions for that officer.

They are directed to obey the orders of the chiefs of their ambulances; to make requisition for supplies on the purveyor general through the chief of the ambulance, or, if that officer does not have them in his stores, for the funds to purchase them. When not able to communicate with the purveyor general, they shall make their requisitions for funds on the commandant of the post or station, who is authorized to furnish them.

To send to the purveyor general, through the same channels, a monthly report of receipts and expenditures, and stores remaining on hand in their departments.

To send to the commissary department of the army monthly lists of the employés of their ambulances, according to which they will be paid.

To have under their orders the attendants of the ambulances, to apportion their duties, to remove and replace them with the approval of the chiefs of their ambulances, and to give them also, with his approval, their pay certificates.

In addition to the above duties they are required to supervise the provisioning of the ambulances, and to provide the diet of the patients daily, according to the instructions of the chiefs of their ambulances.

DUTIES OF THE REGIMENTAL SURGEONS.

Of the surgeons of the first class.

They shall accompany their regiments or battalions in all their movements, and attend them when in camp or barracks.

They shall keep their commanding officers informed of the sanitary condition of their men, and make hygienic and sanitary recommendations to them in writing, when they are necessary, so that they may be inserted into the orders of the day.

They shall obey the orders of the chief surgeon of the army.

They are also instructed to attend the wounded during action, limiting themselves to the most urgent indications; to supervise the transportation of the wounded to the rear, and to pin to the clothes of each wounded man a ticket, filled out, on which is printed the following:

1. Name of the patient.
2. Nature of the wound.
3. Projectile extracted? (Yes or no.)
4. Source of the hemorrhage.

They shall see that every soldier in their regiments has a parchment ticket, filled out, and hung round his neck under his clothes, of the following form:

1. Regiment.
2. Battalion.
3. Name.
4. Rank.
5. Company.

For purposes of identification in case of death.

They shall also see that each man has a small case containing—

A triangular bandage, a roller bandage of five meters in length with thread and safety pins, a "Guide for the Soldier during War,"* six common pins, and a piece of muslin twenty centimeters by ten.

After an action they shall assure themselves that all the wounded have been removed from the field, and make a report of the dead and wounded, giving their names to their commanding officer, and to the chief surgeon of the army.

When these duties have been accomplished, they are instructed to give their professional services, to the ambulances, or wherever the chief surgeon may consider them necessary.

They shall make a monthly report to the chief surgeon according to the prescribed form (see appendix), containing the sanitary statistics of their regiments and a weekly list of sick.

They shall also supervise their subordinates, and see that the necessary stores are kept on hand and in good condition.

The surgeons of the second class shall obey the orders of their chiefs.

OF THE MEDICAL CADETS AND APOTHECARIES.

The cadets and apothecaries of ambulances and regiments shall be under the orders of their senior medical officer.

The apothecaries are required to keep account of the stores in their charge, to make requisitions upon the chief pharmacist through their senior medical officer, to put up prescriptions, and to aid in the care of the sick.

The cadets shall take charge of such cases as are intrusted to them, and shall accompany the surgeons in their visits to the sick.

To provide a sufficient supply of disciplined men to perform the duties of dressers, nurses, stretcher-carriers, &c., the regulations increase the number of men in each regiment and battalion 3 per cent., and direct that these extra men, after they have learned their duties as soldiers, shall be turned over to the sanitary service and instructed in their new duties. An additional rate of pay is allowed these men, after the senior medical officer of the ambulance or regiment to which they are attached has pronounced them fit for duty in their new capacities.

Excepting in case of actual fighting, when all of the above-mentioned attendants shall be turned over to the sanitary service, half of them shall remain on duty in their regiments or barracks, so that their discipline shall not suffer, the other half remaining on duty in the ambulances and hospitals, alternating at intervals with the former half.

The dressers are required to learn the duties of the cadets, to accompany the troops in battle, to take charge of squads of stretcher-carriers, to assist in the care of the wounded after actions, and when they are transported from one point to another.

The duties of the nurses are, to accompany the dressers as their assistants in battle, to act as stretcher-carriers, and to perform such other duties as may be assigned them by the medical officers.

The members of the sanitary service shall not bear arms, and in actual combat shall wear the Geneva badge of the Red Cross.

The relative rank of the officers and men of the sanitary service is fixed as follows, by the orders establishing the corps:

The chief surgeon of the army ranks with colonel.

The assistant chief surgeon of the army ranks with lieutenant-colonel.

Chief of ambulance or hospital ranks with lieutenant-colonel.

A surgeon of the first class ranks with major.

The purveyor general ranks with major.

The chief pharmacist ranks with major.

A surgeon of the second class ranks with captain.

The secretary to chief surgeon ranks with captain.

The statistician ranks with lieutenant.

The assistant to purveyor general ranks with lieutenant.

The assistant to chief pharmacist ranks with lieutenant.

* See appendix, page 348.

Ambulance purveyors rank with sub-lieutenant.

Apothecaries (*practicantis de farmacia*) rank with sub-lieutenant.

Medical cadets rank with sub-lieutenant.

Steward ranks with sergeant.

Several changes have been made in the *personnel* and pay of the service since the last organization, but at present it remains substantially as constituted in May and August, 1881, although active operations have nearly ceased, and the army at present merely occupies the enemy's country.

The organization is essentially that of an army in active campaign, although it was intended to be fitted for the peace as well as the war establishment.

There are doubtless defects and inconsistencies in this sanitary service, but it is nevertheless admirably suited to an army which is compelled to move rapidly in an enemy's country, either in masses or in small detachments; for the completeness of its organization—containing, as it does, its own commissaries, purveyors, and means of transportation—enables it to be constantly ready and prepared to move quickly with large or small bodies of troops.

The authority of the head of the service over his subordinates and *materiel*, in which he is untrammelled by outside interference, permits him to use the means at his command in the best possible manner; and the fact that he has this authority fixes the responsibility of an efficient use of his corps upon him alone, and goes far to insure that object.

The service can be contracted or expanded according to the requirements of the army without changing its organization, and when the army becomes one of occupation instead of operations, as it is still styled, although the great bulk of it is stationed in the conquered cities of Peru at present, the functions of all its officers and employés are still fixed and definite, those of the ambulances attending the hospitals, and the regimental medical officers remaining with their regiments in their cuartels or barracks, while the *materiel* of the ambulances is kept ready for service in the field at any time.

The offices of secretary, statistician, pharmacist, and purveyor being well paid, and those who occupy them having suitable rank and privileges, responsible and capable men are willing to fill these positions, thus relieving the medical officers proper of much non-professional labor, which could not but diminish their usefulness as surgeons.

APPENDIX.

FORMS USED IN THE SANITARY SERVICE OF THE ARMY OF OPERATIONS.

No. 1.—*Bed ticket.*

Hospital of ____. Ward of ____, No. ____. Name, ____. Age, ____. Rank, ____. Regiment, ____. Nationality, ____. Place of birth, ____. Date of admission, ____—____. Diagnosis (in surgical cases the situation and nature of the wound or lesion is indicated). In what battle patient was wounded, ____. Time and place of contraction of the disease, ____. Nature of the projectile, _____.	Treatment: (Here operations and complications are described, and the description can be carried on to other tickets if necessary.) Result, and date of discharge. Signature of the surgeon.
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No. 2.—*Weekly medico-chirurgical report of sick treated in ward* ———, *from* ——— *to* ———, 1882.

Disease.	Remaining from last report.	Admitted.	Total number treated.	Discharged.	Death.	Number remaining.	Observations.
Total.....							

LIMA, ——— —, 1882.

(Signature of the surgeon.)

No. 3.—*Military hospital of* ———. *Weekly report of sick from* ——— *to* ———, 188—

Total	Wards.	Diseases.										Observations.					
		Remaining at last report.	Admissions.	Total number treated.	Discharged.	Deaths.	Number remaining.	Malarial diseases.		Diarrhoea.	Dysentery.		Venereal.	Cutaneous.	Rheumatic.	Wounds.	Miscellaneous.
								Simple.	Malignant.								

LIMA, ——— —, 1882.

(Signature of the chief of the hospital.)

No. 4.—*Weekly report of hospitals from ——— to ———, 188—.*

OFFICE OF THE SUPERINTENDENT OF THE SANITARY SERVICE OF THE ARMY OF OPERATIONS.

Hospitals.	Number remaining from preceding week.	Admissions.	Total number treated.	Discharged.	Deaths.	Number remaining.	Diseases.								Observations.	
							Malarial diseases.		Diarrhoea.	Dysentery.	Venereal.	Cutaneous.	Rheumatic.	Wounds.		Miscellaneous.
							Single.	Malignant.								
Dos De Mayo..																
Santa Sofia																
Guadalupe.....																
Chorrillos.....																
Huacho.....																
Chosica																
Total																

LIMA, ——— —, 1882.

Approved.

Signature of the statistician general.

No. 5.———— *medico-chirurgical report of sick treated in the cuartel of the battalion ———, of ——— men ———, from ——— to ———, 1882.*

Diseases.	Number remaining at last report.	Admissions.	Total number treated.	Discharged.	Sent to hospital.	Deaths.	Total number in the cuartel.	Total number in the hospital.	Observations.
Total									

LIMA, ——— —, 1882.

(Signature of the surgeon.)

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No. 6.—*Weekly report of sick treated in the cuartels of Lima and ———, from ——— to ———, 1882.*

OFFICE OF THE SUPERINTENDENT OF THE SANITARY SERVICE OF THE ARMY.

Regiments or battalions.	Number of men.	Number of sick remaining from last report.	Admissions.	Sent to hospital.	Discharged.	Number of sick in the hos- pitals.	Diseases.								Observations.	
							Malarial diseases.		Diarrhœa.	Dysentery.	Venereal.	Cutaneous.	Rheumatic.	Wounds.		Miscellaneous.
							Simple.	Malignant.								
"Arica," 4th of the line.																
"Santiago," 5th of the line.																
"Esmeralda," 7th of the line.																
"Curico".....																
"Miraflores "																
"Victoria"																
"Bulnes"																
"San Fernando".																
Artillery No. 1 ..																
Mounted grena- diers.																
Carbineers of "Yungai."																
Mounted chas- seur.																
Total																

LIMA, ——— —, 188—.

^{30UPA}
Approved.

(Signature of the Statistician general.)

(Signature of the chief surgeon of army.)

No. 7.

WAR OF THE PACIFIC.

NOTE.—A copy will be sent to the sanitary commission in Santiago,* with lists of the names of the dead, discharged (cured), and those on (sick) leave, and the “bed tickets” from which this report is made. A separate line will be devoted to any unusual case.

Report No. _____.
Hospital of _____.
Ambulance No. _____. } For the month of _____.

Diseases.	Cases.	Deaths.	Discharged.	On (sick) leave.	Observations.
CLASS I.—ZYMOTIC DISEASES.					
Order I.—MIASMATIC DISEASES.					
1. Abdominal typhus.....					
2. Exanthematic typhus					
3. Cerebro-spinal typhus.....					
4. Typho-malarial fever, paludal.....					
5. Yellow fever.....					
6. Simple intermittent fever.....					
7. Pernicious intermittent fever.....					
8. Diarrhœa, acute.....					
9. Diarrhœa, chronic.....					
10. Dysentery, acute					
11. Dysentery, chronic.....					
12. Erysipelas.....					
13. Small-pox					
14. Measles					
15. Scarlatina					
16. Diphtheria					
17. Mumps					
18. Epidemic catarrh, influenza					
19. Debility					
20. “Verruga peruana”					
21. Other diseases of the same order					
Order II.—ENTHETIC DISEASES.					
22. Syphilis					
23. Gonorrhœa					
24. Orchitis					
25. Stricture of urethra					
26. Purulent ophthalmia					
27. Other diseases of same order					
Order III.—DIETETIC DISEASES.					
28. Scurvy					
29. Purpura.....					
30. Delirium tremens					
31. Drunkenness					
32. Chronic alcoholism					
33. Other diseases of same order.....					
CLASS II.—CONSTITUTIONAL DISEASES.					
Order I.—DIATHETIC DISEASES.					
34. Gout					
35. Acute rheumatism					
36. Chronic rheumatism					
37. Anæmia					
38. Dropsy, idiopathic.....					
39. Cancer					
40. Tumors.....					
41. Other diseases of same order					
Order II.—TUBERCULOUS DISEASES.					
42. Phthisis					
43. Scrofula.....					
44. Other diseases of same order.....					

* The “sanitary commission” corresponds to the central bureau of medicine and surgery.

War of the Pacific—Continued.

Diseases.	Cases.	Deaths.	Discharged.	On (sick) leave.	Observations.
*CLASS III.—PARASITIC DISEASES.					
45. Itch					
46. Tænia					
47. Ascarides					
48. Other worms					
49. Other diseases of same class					
CLASS IV.—LOCAL DISEASES.					
Order I.—NERVOUS SYSTEM.					
50. Apoplexy					
51. Epilepsy					
52. Traumatic tetanus					
53. Traumatic tetanus from exposure to cold					
54. Headache					
55. Mental alienation					
56. Encephalitis					
57. Cerebral meningitis					
58. Myelitis					
59. Neuralgia					
60. Paralysis					
61. Insolation					
62. Other diseases of the same order					
Order II.—EYES.					
63. Amaurosis					
64. Cataract					
65. Ophthalmia					
66. Conjunctivitis					
67. Iritis					
68. Hemeralopia					
69. Other diseases of the same order					
Order III.—EARS.					
70. Earache					
71. Internal otitis					
72. Deafness					
73. Otorrhœa					
74. Other diseases of same order					
Order IV.—CIRCULATORY APPARATUS.					
75. Aneurism					
76. Myocarditis					
77. Endocarditis					
78. Valvular diseases					
79. Pericarditis					
80. Hydropericardium					
81. Phlebitis					
82. Varices					
83. Varicocele					
84. Other diseases of same order					
Order V.—RESPIRATORY APPARATUS.					
85. Laryngitis					
86. Acute bronchitis					
87. Chronic bronchitis					
88. Pleurisy					
89. Hydrothorax					
90. Pneumonia					
91. Epistaxis					
92. "Pulmonary apoplexy"					
93. Asthma					
94. Other diseases of the same order					
Order VI.—DIGESTIVE APPARATUS.					
95. Intestinal colic					
96. Constipation					

War of the Pacific—Continued.

Diseases.	Cases.	Deaths.	Discharged.	On (sick) leave.	Observations.
CLASS VI.—LOCAL DISEASES—Continued.					
Order VI.—DIGESTIVE APPARATUS—Continued.					
97. Cholera (cholera morbus)					
98. Cirrhosis of the liver					
99. Ascites from hepatic disease					
100. Ascites from cardiac disease					
101. Dyspepsia					
102. Disease of the pancreas					
103. Disease of the spleen					
104. Fistula of the anus					
105. Prolapse of anus					
106. Hernia					
107. Hæmatemesis					
108. Intestinal hæmorrhage					
109. Tonsillitis					
110. Gastritis					
111. Enteritis					
112. Peritonitis					
113. Acute hepatitis					
114. Chronic hepatitis					
115. Icterus					
116. Hæmorrhoids					
117. Other diseases of same order					
Order VII.—GENITO-URINARY APPARATUS.					
118. Calculus and gravel					
119. Diabetes					
120. Bright's disease					
121. Diseases of the prostate					
122. Orchitis, non-syphilitic					
123. Nephritis					
124. Cystitis					
125. Incontinence of urine					
126. Dysuria					
127. Hydrocele					
128. Sarcocoele					
129. Ulcers, non-syphilitic					
130. Other diseases of same order					
Order VIII.—BONES AND ARTICULATIONS.					
131. Anchylosis					
132. Exostosis					
133. Caries					
134. Arthritis					
135. White swelling					
136. Ostitis					
137. Periostitis					
138. Necrosis					
139. Other diseases of the same order					
Order IX.—TEGUMENTARY SYSTEM.					
140. Abscesses					
141. Furuncles					
142. Pustules					
143. Ulcers					
144. Whitlow					
145. Cutaneous diseases					
146. Other diseases of the same order					
CLASS V.—WOUNDS, ACCIDENTS, ETC.					
Order I.					
147. Burns					
148. Contusions					
149. Cerebral concussions					
150. Cerebral compressions					
151. Drowned					
152. Sprains					
153. Luxations					

War of the Pacific—Continued.

Diseases.	Cases.	Deaths.	Discharged.	On (sick) leave.	Observations.
CLASS V.—WOUNDS, ACCIDENTS, ETC.—Continued.					
Order I.—Continued.					
154. Simple fracture					
155. Compound fracture.....					
156. Multiple fracture.....					
157. Wounds from fire-arms					
158. Incised wounds					
159. Contused wounds.....					
160. Punctured wounds					
161. Poisoning					
162. Other accidents.....					
Order II.					
163. Homicide.....					
Order III.					
164. Suicide					
Order IV.					
165. Execution					
166. Diseases not classified					

“GUIDE FOR THE SOLDIER IN THE FIELD.”

The above is the title of a small pamphlet containing sanitary instructions for soldiers, and directions for emergencies, when no surgeon is present. The regulations direct that one of these pamphlets shall be issued to every soldier, who is required to carry it on his person at all times.

The “Guide” gives plain and concise directions for making temporary slings and splints, arresting hemorrhage, closing gaping wounds, administering stimulants, and resuscitating half-drowned men.

The pocket case of bandages, plaster, &c., referred to on page 27, is also issued to all officers and soldiers, with the “Guide,” which contains instructions for using them.

Advice as to the use of drinking water, spirits, the avoidance of pulmonary diseases, diarrhœa, &c., is also contained in the “Guide.”

CONTENTS OF THE AMBULANCE CHESTS.

- 1 amputation knife.
- 1 interosseous knife.
- 2 bistouries, straight and convex.
- 1 saw with a spare blade.
- 1 screw ball extractor.
- 1 bullet forceps.
- 1 Esmarch bandage.
- 12 suture needles.
- 2 urethral sounds.
- 5 bottles of 60 grams capacity, containing chloroform, laudanum, glycerine, perchloride of iron solution, and compound tincture of cardamom.
- 1 artery forceps.
- 20 powders of gram .1 of tartar-emetic.
- 20 powders of gram .2 of sulphate of quinia, and a corresponding supply of pins, surgical needles, ligature silk, sponges, roller bandages, lint, splints, drainage tubing, &c.

CONTENTS OF THE SURGICAL CASES.

(*Cantinas de cirujia.*)

- 1 amputation and resection case.
- 1 pocket case of instruments.
- 2 dressing cases (surgical).

- 2 dressing syringes.
- 3 hypodermic syringes.
- 4 enema syringes.
- 1 set of cupping glasses.
- 1 dental case.
- 10 meters of drainage tubing of various calibers.
- 30 grams of agaric.
- 25 thigh splints, 25 for the leg, and 30 for the arm and forearm.
- 4 wire splints for fractured leg and thigh.
- 1 portable operating table.
- Suture thread, raw cotton, tarred oakum, bandages, lint, plaster, basins, cups, muslin, pins, lanterns, &c., &c., in corresponding quantity, which, packed in two boxes, make a light load for a mule.

CONTENTS OF THE DISPENSARY CHESTS.

Two hundred and eighty grams of each of the following medicines in bottles of that capacity: Castor oil, salicylic acid, citric acid, tartaric acid, carbolic acid, bromide of potassium, bicarbonate of soda, subnitrate of bismuth, prepared chalk, chloroform, three bottles of 280 grams, chloral hydrate, calcined magnesia, perchloride of iron, sulphate of quinine, sulphuric ether, compound tincture of cardamom, two bottles of 280 grams, Sydenham's laudanum, salicylate of soda, glycerine, extract of cinchona, liquid ammonia, 130 grams, sulphuric acid, acetate of lead, spirits of turpentine, catechu (electuary), nitrate of potash, powdered rhubarb, permanganate of potash, nitrous ether, tincture of iodine, citrine ointment, extract of belladonna, blue mass, fused nitrate of silver.

Thirty-five grams of each of the following, in bottles: Essence of mint, creosote, tartar-emetic, calomel, extract of digitalis, extract of opium, extract of rhubarb, Kerme's mineral, muriate of morphia.

The quantities of the following are not specified: Alcohol, oil of almonds, manna, powdered gum arabic, linseed, linseed meal, flowers of elder and chamomile, simaruba, columbo, cinchona bark, mustard leaves of Rigolot, agaric.

Also mortars, spatulas, percolators, &c., for getting up a small field dispensary.

CONTENTS OF THE AMBULANCE SUPPLY CHEST.

Rice, potato-meal, grits, salt, sugar, vermicelli, coffee, tea, port wine, wine of the country, brandy, flour, condensed milk or "white food,"* and butter.

Three portable stoves, with complete kitchen apparatus of sufficient capacity to cook for 200 sick, with a supply of charcoal or firewood.

The amount of the above provisions is not specified in the supply table, but is regulated by circumstances.

DOS DE MAYO HOSPITAL, IN LIMA, PERU.

Of several hospitals in Lima and its vicinity, used during the Chilean occupation as military hospitals, that of the "Dos de Mayo" is the most important, and indeed the only one that is worthy of special notice.

This hospital is situated on the outskirts of Lima, near the river Rimac, into which it is drained. The building, the materials of which are adobe and stone, covers an area of about one ordinary city block. It is a one-storied structure, rectangular in form.

In the center of the hospital inclosure is a large octagonal court-yard, handsomely cultivated as a flower garden. From this central court the principal wards and offices radiate as in the plan, the triangular spaces between them forming other smaller court-yards.

The advantages of this arrangement are very obvious. By it the wards are isolated, and yet convenient of access from a common center without crowding or interference with light and ventilation.

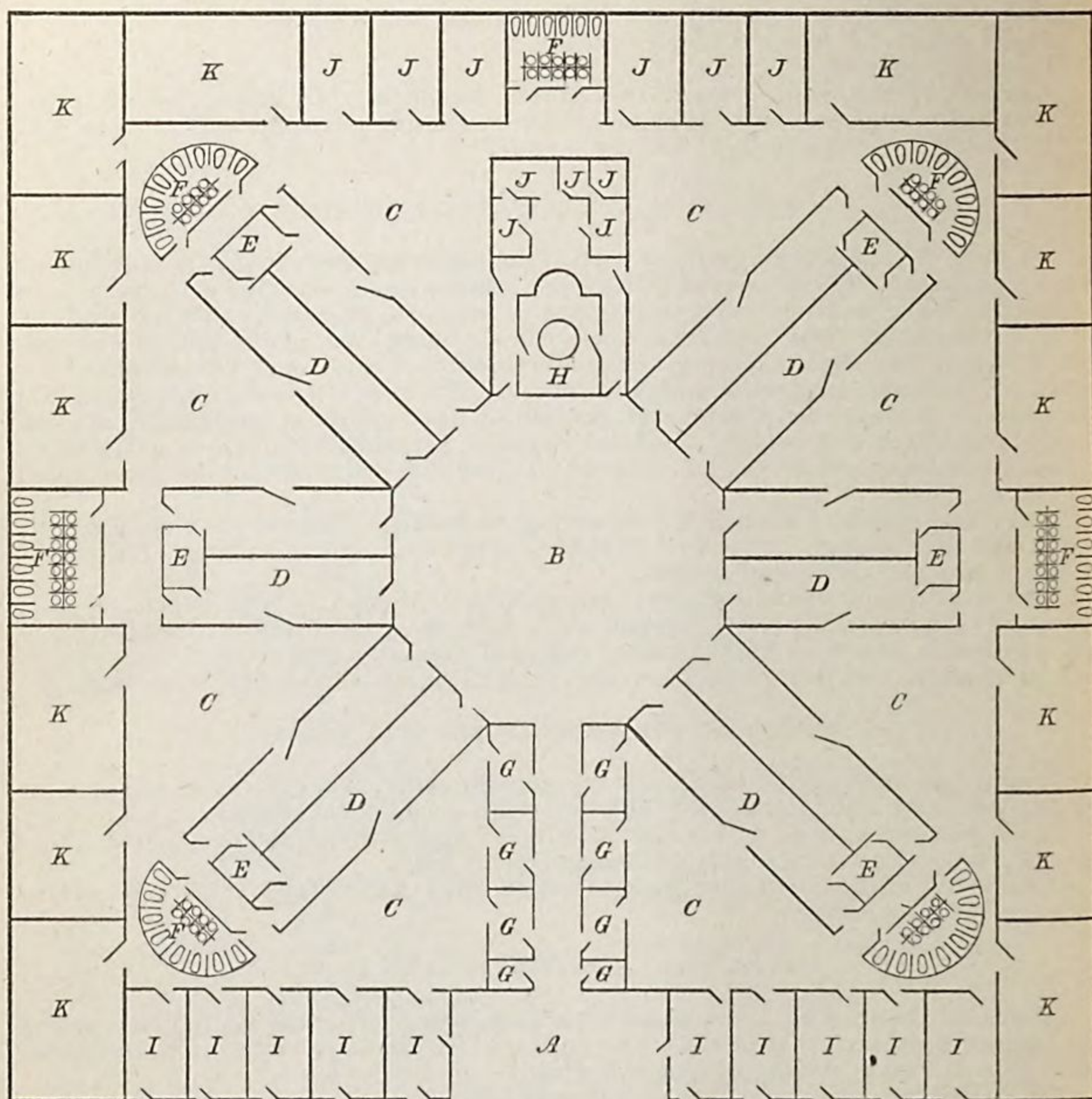
Any of these wards could be destroyed and rebuilt without interfering with the working of the rest of the hospital, which, in case of infection of one or more of them, might become necessary. As they are built principally of adobe, such demolition and rebuilding could be easily and cheaply accomplished.

This plan of arranging the buildings was frequently used in the barrack hospitals during the civil war in the United States, and it proved to be an excellent one. In the rear of the wards are the latrines and bath-rooms, which are entirely detached from the wards proper, and are complete and well arranged.

* "Manjar blanco," made of the breasts of fowls mixed with sugar, milk, and rice flour.

Only six of the radii are used for wards which are grouped in pairs, as shown in the plan. The remaining two are used, one for the offices of the administration of the hospital, the other as a chapel.

Adjacent to the walls and surrounding the wards are the kitchens, laundry, linen-rooms, mess-rooms, dormitories for servants and laborers, and additional reserves which are only used when the others are filled.



A.—Entrance.
B.—Central court.
C.—Side court.
D.—Wards.
E.—Attendants' rooms.
F.—Latrines and bath-rooms.

G.—Offices of the administration.
H.—Chapel.
I.—Medical officers' quarters.
J.—Quarters for Sisters of Charity.
K.—Kitchens laundries, store-rooms, mess-rooms, dormitories for servants, &c.

The wards proper, *i. e.*, those arranged in radii about the central court, are long narrow rooms, well lighted and ventilated by numerous large windows and doors opening into the central and lateral courts. As it is rare for these windows to be closed in this mild climate, sufficiently good ventilation is secured through them and additional ventilators near the floors and ceilings, no machinery for forced ventilation being required.

The average capacity of each of the twelve radiating wards is fifty beds, which are placed as near together as good hygiene will permit, though not unduly crowded. All the wards, as well as most of the outbuildings, are paved with asphaltum, and the walls plastered.

Diseases.—There were 240 patients, officers and men of the Chilian army, at the time of my visit, which were classified as follows:

Paludal fevers	124
Venereal diseases	67

Cutaneous diseases, herpes, eczema, and scabies.....	25
Dysentery and diarrhœa.....	38
Rheumatism	40
Various other diseases.....	118

The large proportion of paludal diseases amongst the troops, in a climate in which the malarial miasm is by no means intense nor unusually prevalent, was accounted for by the superintendent, Don Alzerrica, of the Chilean sanitary service, by the fact that they are almost entirely unknown in Chili, and consequently that the unacclimated soldiers are extremely susceptible to such influences.

Dr. Alzerrica is chief of an ambulance in the Chilean army, and had, until recently, six subordinate medical officers of the army as assistants, but at present these are replaced by volunteer surgeons, the regular officers having been sent back to their ambulances.

TABLE I.—*Showing the force on each ship, the number admitted and discharged, num-*

Vessels.	Strength.	Strength corrected for time.	Admitted.					Total.
			From last year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	
Alaska, second rate, 1,122 tons, wood, screw; service, 365 days	231	232	7	44	55	37	42	185
Adams, third rate, 615 tons, wood, screw; service, 365 days	177	177	5	39	69	41	35	189
Essex, third rate, 615 tons, wood, screw; service, 365 days	183	183	1	46	44	53	44	188
Hartford, second rate, 1,800 tons, wood, screw; service, 184 days	334	167	.....	.....	.....	86	101	187
Hassler, fourth rate (Coast-Survey); service, 365 days	40	40	.....	5	5	4	6	20
Independence, third rate, 1,891 tons, wood, sails; service, 365 days	135	135	3	47	39	35	40	164
Iroquois, third rate, 695 tons, wood, screw; service, 264 days	163	109	.....	.....	24	39	54	117
Lackawanna, second rate, 1,026 tons, wood, screw; service, 365 days	221	221	4	77	62	51	73	267
McArthur, fourth rate (Coast Survey); service, 365 days	32	32	.....	3	1	1	2	7
Onward, fourth rate, 925 tons, wood, sails; service, 365 days	37	37	1	8	7	7	6	29
Pensacola, second rate, 2,000 tons, wood, screw; service, 375 days	390	390	8	71	62	75	84	300
Ranger, third rate, 541 tons, wood, screw; service, 365 days	130	130	8	62	45	31	42	188
Wachusett, third rate, 695 tons, wood, screw; service, 365 days	168	168	8	66	47	30	29	180
Total	2,242	2,021	45	468	460	490	558	2,021

ber of days under treatment, and average per thousand of force on the Pacific Station.

Discharged.					Continued.	Number of sick days.	Average number of days under treatment.	Daily average num-ber of sick.		Number admitted per thousand of force.
Cured.	Invalided.		Died.	Total.				Absolute.	Per thousand of force.	
	To hospi-tal.	From the service.								
165	17	1	1	184	1	2, 270	12. 27	6. 21	26. 76	797. 41
158	27	2	.....	187	2	1, 253	6. 75	3. 43	19. 32	1, 067. 79
166	14	.....	.....	180	8	2, 043	10. 81	5. 59	30. 55	1, 027. 32
165	10	.....	1	176	11	1, 771	9. 46	9. 62	57. 60	1, 119. 75
16	3	.....	.....	19	1	104	5. 20	. 28	7.	500.
125	34	5	.....	164	.....	1, 064	6. 48	2. 91	21. 55	1, 214. 81
96	16	.....	.....	112	5	1, 056	9. 02	4. 00	30. 69	1, 073. 39
255	8	.....	1	264	3	2 221	8. 31	6. 08	27. 51	1, 208. 14
4	3	.....	.....	7	.....	13	1. 85	. 03	. 93	218. 75
24	2	1	.....	27	2	394	13. 58	1. 07	28. 91	783. 78
283	8	.....	3	294	6	3, 161	10. 53	8. 66	22. 20	769. 23
166	16	1	.....	183	5	1, 302	6. 92	3. 56	27. 38	1, 446. 15
153	23	1	2	179	1	1, 708	9. 54	4. 67	27. 79	1, 071. 42
1, 776	181	11	8	1. 976	45	18, 360	9. 08	50. 30	24. 88	1, 000.

TABLE II.—Showing the number of cases, the discharged to duty, invalided and

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Erysipelas.....	3	1.48	14
Febricula.....	16	7.91	52
Febris continua simplex.....	22	10.88	134
Febris enterica.....	5	2.47	116
Febris intermittens.....	150	74.22	621
Febris remittens.....	34	16.82	290
Morbilli.....	4	1.97	4
Vaccina.....	17	8.41	156
Total.....	251	124.19	1,387
II.—CONSTITUTIONAL DISEASES.			
Adynamia.....	27	13.35	264
Anæmia.....	1	.49	9
Diabetes.....	2	.98	121
Lumbago.....	7	3.46	65
Rheumatismus acutus.....	43	21.27	463
Rheumatismus chronicus.....	51	25.23	301
Scrofula.....	2	.98	27
Senectus.....	1	.49	5
Syphilis primitiva.....	66	32.65	1,122
Syphilis consecutiva.....	95	47	1,387
Torticollis.....	2	.98	3
Total.....	297	146.95	3,767
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Cephalalgia.....	20	9.89	47
Convulsio.....	1	.49	1
Dementia.....	3	1.48	177
Dysphonia.....	1	.49	4
Epilepsia.....	7	3.46	111
Hysteria.....	1	.49	1
Insolatio.....	2	.98	5
Irritatio spinalis.....	1	.49	1
Melancholia.....	2	.98	88
Meningitis.....	1	.49	5
Nausea marina.....	6	2.96	17
Neuralgia.....	44	21.77	281
Paralysis.....	8	3.95	109
Pleurodynia.....	6	2.96	29
Vertigo.....	12	5.93	144
Total.....	115	56.90	1,020
II.—DISEASES OF THE EYE.			
Asthenopia.....	1	.49	3
Conjunctivitis.....	14	6.92	82
Dacrocystitis.....	1	.49	1
Hemeralopia.....	2	.98	2
Iritis.....	1	.49	7
Ophthalmia gonorrhœica.....	1	.49	22
Ophthalmia tarsi.....	1	.49	3
Retinitis.....	5	2.47	138
Ulcus cornæ.....	2	.98	33
Total.....	28	13.85	291
III.—DISEASES OF THE EAR.			
Otalgia.....	4	1.97	10
Otitis.....	4	1.97	14
Otorrhœa.....	4	1.97	17
Surditas.....	2	.98	8
Total.....	14	6.92	49

dead, for each disease, and their ratio per thousand of force on the Pacific Station.

Average number sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.03	.01	4.66	3	1.48							
.14	.06	3.25	16	7.91							
.36	.17	6.09	20	9.89	2	.98					
.31	.15	23.20			3	1.48			1	.49	1
1.70	.84	4.14	147	72.73	1	.49	1	.49			1
.79	.39	8.52	27	13.35	6	2.96					1
.01	.004	1.00			4	1.97					
.42	.20	9.17	17	8.41							
3.8	1.92	5.52	230	113.80	16	7.91	1	.49	1	.49	3
.72	.35	9.77	20	9.89	6	2.96					1
.02	.008	9	1	.49							
.33	.16	60.50	1	.49							1
.17	.08	9.28	7	3.46							
1.26	.62	10.76	37	18.30	4	1.97					2
.82	.40	5.90	48	23.75	2	.98					1
.07	.03	13.50			2	.98					
.01	.004	5					1	.49			
3.07	1.51	17	60	29.68	3	1.48					3
3.8	1.88	14.60	70	34.63	18	8.90	3	1.48			4
		1.50	2	.98							
10.32	5.10	12.68	246	121.22	35	17.31	4	1.97			12
.12	.05	2.35	20	9.89							
		1			1	.49					
.48	.23	59			3	1.48					
.01	.004	4	1	.49							
.30	.14	15.85	4	1.97	2	.98	1	.49			
		1			1	.49					
.01	.004	2.5	2	.98							
		1	1	.49							
.24	.11	44			2	.98					
.01	.004	5							1	.49	
.04	.01	2.83	6	2.96							
.76	.37	6.38	39	19.29	4	1.97					1
.29	.14	13.62	6	2.96	2	.98					
.07	.03	4.83	5	2.47							1
.39	.19	12	9	4.45	1	.49					2
2.79	1.38	8.87	93	46.01	16	7.91	1	.49	1	.49	4
.22	.10	3	1	.49							
		5.57	12	5.93	1	.49					1
		1			1	.49					
		1	1	.49	1	.49					
.01	.004	7	1	.49							
.06	.02	22	1	.49							
		3			1	.49					
.37	.18	27.60	1	.49	3	1.48					1
.09	.04	16.50	1	.49	1	.49					
.79	.39	10.39	18	8.90	8	3.95					2
.02	.008	2.5	4	1.97							
.03	.01	3.5	4	1.97							
.04	.01	4.25	4	1.97							
.02	.008	4	1	.49	1	.49					
.3	.06	3.5	13	6.43	1	.49					

TABLE II.—*Showing the number of cases, the discharged to duty, invalided and*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
IV.—DISEASES OF THE TEETH.			
Odontalgia	4	1. 97	11
Parulis	1	. 49	3
Total	5	2. 47	14
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Aneurysma	4	1. 97	202
Angina pectoris	2	. 98	28
Morbi valvularum cordis	5	2. 47	70
Palpitatio	7	3. 46	152
Phlebitis	1	. 49	3
Varix	1	. 49	11
Total	20	9. 89	466
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Asthma	8	3. 95	34
Bronchitis acuta	62	30. 67	466
Bronchitis chronica	9	4. 45	186
Catarrhus	96	47. 50	405
Hæmoptysis	2	. 98	19
Laryngitis	5	2. 47	115
Phthisis pneumonica acuta	1	. 49	2
Phthisis pneumonica chronica	14	6. 92	313
Pleuritis	14	6. 92	357
Pneumonia	11	5. 44	170
Total	222	109. 84	2, 067
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Ascites	1	. 49	1
Cholera morbus	15	7. 42	31
Colica	17	8. 41	48
Congestio hepatis	4	1. 97	18
Constipatio	12	5. 93	89
Diarrhœa acuta	69	34. 14	282
Diarrhœa chronica	2	. 98	9
Dysenteria acuta	18	8. 90	168
Dysenteria chronica	2	. 98	31
Dyspepsia	10	4. 94	28
Fistula in ano	3	1. 48	19
Gastritis	2	. 98	11
Hæmorrhoids	11	5. 44	45
Hepatitis chronica	2	. 98	32
Hernia	19	9. 40	215
Icterus	9	4. 45	123
Peritonitis	2	. 98	74
Pharyngitis	14	6. 92	59
Tonsillitis	42	20. 78	171
Typhlitis	1	. 49	6
Vermes	3	1. 48	16
Total	258	127. 65	1, 476

dead, for each disease, and their ratio per thousand of force, &c.—Continued.

Average number sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.03	.01	2.75	4	1.49							
		3	1	.49							
.13	.01	2.8	5	2.47							
.55	.27	50.50			4	1.97					
.07	.03	14			2	.98					
.19	.09	14	2	.98	3	1.48					
.41	.20	21.71	4	1.97	3	1.48					
		3	1	.49							
.03	.01	11			1	.49					
1.27	.62	23.3	7	3.46	13	6.43					
.09	.04	4.25	6	2.96			1	.49			1
1.27	.62	7.51	58	23.75	3	1.48					1
.50	.24	20.66	7	3.46	2	.98					
1.10	.54	4.21	94	46.51	1	.49					1
.05	.02	9.5	2	.98							
.31	.15	23	2	.98	3	1.48					
		2			1	.49					
.85	.42	22.35	2	.98	10	4.94	1	.49			1
.97	.47	25.5	11	5.44	3	1.48					
.46	.22	15.45	5	2.47	3	1.48			3		
5.66	2.80	9.31	187	92.52	26	12.86	2	.98	3	1.48	4
		1			1	.49					
.08	.04	2.06	15	7.42							
.13	.06	2.82	17	8.41							
.04	.01	4.5	4	1.97							
.24	.11	7.41	12	5.93							
.77	.38	4.08	69	34.14							
.02	.008	4.5	2	.98							
.46	.22	9.33	17	8.41					1	.49	
.08	.03	15.5			2	.98					
.07	.03	2.8	9	4.45	1	.49					
.05	.02	6.33	1	.49	2	.98					
.03	.01	5.5	2	.98							
.12	.05	4.09	9	4.45	1	.49	1	.49			
.08	.04	16	2	.98							
.58	.28	11.31	14	6.92	5	2.47					
.33	.16	13.66	6	2.96	3	1.48					
.20	.09	37	2	.98							
.16	.07	4.21	14	6.92							
.46	.22	4.07	42	20.78							
.01	.004	6	1	.49							
.04	.01	5.33	3	1.48							
4.04	1.99	5.72	241	119.24	15	7.42	1	.49	1	.49	

TABLE II.—Showing the number of cases, the discharged to duty, invalided and

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria	1	.49	3
Colica nephritica	1	.49	2
Chancroides	26	12.86	282
Cystitis	1	.49	1
Enuresis	2	.98	11
Gonorrhœa	58	23.75	759
Hæmaturia	2	.98	4
Orchitis	44	21.77	519
Paraphymosis	2	.98	30
Phymosis	1	.49	4
Urethræ strictura	7	3.46	90
Varicocele	2	.98	3
Total	147	72.73	1,708
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Ankylosis	1	.49	4
Hydrops articolorum	1	.49	4
Necrosis	1	.49	3
Synovitis	3	1.48	17
Total	6	2.96	28
X.—DISEASES OF THE INTEGUMENTORY SYSTEM.			
Abscessus	45	22.26	610
Anthrax	3	1.48	26
Ecthyma	2	.98	26
Eczema	1	.49	3
Erythema	2	.98	5
Furunculus	62	30.67	306
Herpes	9	4.45	80
Onychia	2	.98	6
Paronychia	13	6.43	118
Pemphigus	4	1.97	44
Pernio	2	.98	7
Psoriasis	1	.49	51
Scabies	16	7.91	110
Tinea	2	.98	23
Ulcus	19	9.40	219
Urticaria	1	.49	16
Verruca	1	.49	19
Total	185	91.53	1,669
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis	56	27.70	972
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Cystis	2	.98	19
Sarcoma	1	.49	1
Total	3	1.48	20
C.—POISONS.			
Alcoholismus	26	12.86	77
Colica pictonum	1	.49	1
Ebriositas	2	.98	5
Vulnus Venenatum	4	1.97	17
Total	33	16.32	100

dead, for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From serv-ice.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
		3	1	.49							
		2	1	.49							
.77	.38	10.84	23	11.38	1	.49					2
		1	1	.49							
.03	.01	5.5			1	.49					1
2.08	1.02	13.08	54	26.71	3	1.48					1
.01	.004	2	2	.98							
1.39	.68	11.79	41	20.28	1	.49					2
.08	.03	15	2	.98							
.01	.004	4	1	.49							
.24	.11	12.85	4	1.97	2	.98	1	.49			
		1.5	2	.98							
4.67	2.31	11.61	132	65.31	8	3.95	1	.49			6
.01	.004	4	1	.49							
.01	.004	4	1	.49							
		3	1	.49							
.04	.02	5.66	2	.98							1
.07	.03	4.66	5	2.47							1
1.67	.46	13.55	38	18.79	6	2.96					1
.07	.03	8.66	3	1.48							
.07	.03	13	2	.98							
		3	1	.49							
.01	.004	2.5	2	.98							
.81	.40	4.93	61	30.18			1	.49			
.21	.10	8.88	8	3.95	1	.49					
.01	.004	3	2	.98							
.32	.15	9.07	12	5.93	1	.49					
.12	.05	11	3	1.48							1
.01	.004	3.5	2	.98							
.13	.06	51			1	.49					
.30	.14	6.87	8	3.95	8	3.95					
.06	.02	11.5	2	.98							
.60	.29	11.52	15	7.42	4	1.97					
.04	.01	16	1	.49							
.05	.02	19	1	.49							
4.57	2.26	9.02	161	79.66	21	10.39	1	.49			2
2.66	1.31	17.35	47	23.28	8	3.95					1
.05	.02	9.5	2	.98							
		1	1	.49							
.05	.02	6.66	3	1.48							
.21	.10	2.96	24	11.87							2
		1	1	.49							
.01	.004	2.5	2	.98							
.04	.01	4.25	4	1.97							
.27	.13	3.03	31	15.33							2

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Ascites								
Cholera morbus					1			
Colica					1			
Congestio hepatis	2							
Constipatio								
Diarrhœa acuta	3				12			
Dysenteria acuta	2				1			
Dyspepsia	1							
Fistula in ano	2	1						
Gastritis	1							
Hæmorrhoids	1				3	1		
Hepatitis chronica								
Hernia					1	1		
Icterus	2	1			2	1		
Peritonitis								
Pharyngitis	1							
Tonsillitis	2				8			
Vermes					1			
Total	17	2			30	3		
Ratio per thousand	73.27	8.62			169.49	16.96		
Number of sick days	108				127			
Average number sick daily	.29				.34			
Av. number sick daily per thousand	1.25				1.92			
Average duration of treatment	6.35				4.23			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Chancroides	6							
Enuresis								
Gonorrhœa	7	1			1			
Hæmaturia								
Orchitis	4				6	1		
Paraphymosis								
Urethræ strictura	1		1		2			
Varicocele								
Total	18	1	1		9	1		
Ratio per thousand	77.58	4.31	4.31		50.84	5.64		
Number of sick days	285				80			
Average number sick daily	.78				21			
Average number sick daily per thousand	5.90				1.18			
Average duration of treatment	15.83				8.8			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....					1			
Synovitis.....								
Total.....					1			
Ratio per thousand.....					5.64			
Number of sick days.....					7			
Average number sick daily.....					.01			
Average number sick daily per thousand.....					.05			
Average duration of treatment.....					7			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abcessus.....	5	1						
Erythema.....	1							
Furunculus.....	8				6			
Herpes.....					1	1		
Paronychia.....					6	1		
Pemphigus.....	2							
Scabies.....								
Tinea.....	1							
Ulcer.....	1							
Total.....	18	1			13	2		
Ratio per thousand.....	77.58	4.31			73.44	11.29		
Number of sick-days.....	265				99			
Average number of sick daily.....	.72				.27			
Av. number of sick daily per thousand.....	3.10				1.52			
Average duration of treatment.....	14.72				7.61			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....								
Ratio per thousand.....								
Number of sick-days.....								
Average number of sick daily.....								
Av. number of sick daily per thousand.....								
Average duration of treatment.....								

for each disease, on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.			Cases.	Invalided.			Cases.	Invalided.			Cases.	Invalided.		
	To hospital.	From service.	Dead.		To hospital.	From service.	Dead.		To hospital.	From service.	Dead.		To hospital.	From service.	Dead.
1												1			
1												1			
5.46												7.40			
2												4			
												.01			
												.07			
2												4			
4				4				1				9	1		
9				5				1				3			
1												1			
												16	8		
												1			
3				7								4	3		
17				16				2				34	12		
92.89				95.80				50.00				251.85	88.88		
105				180				25				274			
.28				.97				.06				.75			
1.53				5.80				1.50				5.55			
6.17				11.25				12.05				8.05			
4				1	1							2	1		
21.85				5.98	5.98							14.81	7.40		
155				7								4			
.42				.03								.01			
2.29				.17								.07			
38.75				7.00								2.00			

TABLE II.—*Showing the number of cases, the discharged to duty, invalided and*

Diseases and injuries,	Cases.		Number of sick days.
	Number.	% of force.	
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio.....	16	7.91	90
Ambustio.....	19	9.40	176
Concussio cerebri.....	1	.49	1
Concussio spinalis	1	.49	6
Contusio.....	100	49.47	551
Fractura.....	24	11.87	526
Luxatio.....	1	.49	26
Stremma	91	45.02	752
Vulnus contusum.....	44	21.77	409
Vulnus incisum.....	29	14.34	176
Vulnus laceratum	32	15.83	399
Vulnus punctum	18	8.90	128
Vulnus sclopetarium	2	.98	70
Total	378	187.03	3,310
E.—FEIGNED DISEASES.			
Rheumatismus	2	.98	15
Hypertrophia cordis.....	1	.49	1
Total	3	1.48	16
Grand aggregate	2,021	1,000	18,360

dead, for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.24	.11	5.62	16	7.91	.....	.....	.....	.....	.....	.....	.....
.48	.23	9.26	19	9.40	.....	.....	.....	.....	.....	.....	.....
.....	.....	1	.....	.....	.....	.....	.....	.....	1	.49	.....
.01	0.04	6	1	.49	.....	.....	.....	.....	.....	.....	.....
1.50	.74	5.50	96	47.50	2	.98	.....	.....	.....	.....	2
1.44	.71	21.91	13	6.43	9	4.45	.....	.....	.....	.....	2
.07	.03	26	.....	.....	1	.49	.....	.....	.....	.....	.....
2.06	1.01	8.26	89	44.83	.....	.....	.....	.....	.....	.....	2
1.12	.55	9.29	43	21.27	.....	.....	.....	.....	.....	.....	1
.48	.23	6.06	28	13.85	1	.49	.....	.....	.....	.....	.....
1.09	.53	12.46	29	14.34	1	.49	.....	.....	1	.49	1
.35	.17	7.11	18	8.90	.....	.....	.....	.....	.....	.....	.....
.19	.09	35	2	.98	.....	.....	.....	.....	.....	.....	.....
9.06	4.48	8.75	354	175.16	14	6.92	.....	.....	2	.98	8
.....											
.04	.01	5.33	2	.98	.....	.....	.....	.....	.....	.....	.....
.....	.....	1	1	.49	.....	.....	.....	.....	.....	.....	.....
.04	.01	5.33	3	1.48	.....	.....	.....	.....	.....	.....	.....
50.30	24.88	9.08	1,776	878.77	181	89.95	11	5.44	8	3.95	45

TABLE III.—*Showing the number of cases, the invalided and*

Vessels or stations	Alaska.			Adams.		
Disease and injuries.	Cases.	Invalided.		Cases.	Invalided.	
		To hospital.	From service.		To hospital.	From service.
Dead.				Dead.		
A.—GENERAL DISEASES.						
I.—ZYMOTIC DISEASES.						
Erysipelas	1					
Febricula						
Febris continua simplex	2					
Febris enterica	2	2				
Febris intermittens	10			16		1
Febris remittens				12	1	
Morbilli				1	1	
Vaccina	11			4		
Total	26	2		33	2	1
Ratio per thousand	112.06	8.62		186.44	11.29	5.64
Number of sick days	188			196		
Average number sick daily	.51			.53		
Av. number sick daily per thousand ..	2.19			2.99		
Average duration of treatment	7.23			5.93		
II.—CONSTITUTIONAL DISEASES.						
Adynamia				4	1	
Anæmia						
Diabetes	2					
Lumbago	2					
Rheumatismus acutus	1			8	1	
Rheumatismus chronicus	6			5		
Scrofula						
Senectus						
Syphilis primitiva	5			6		
Syphilis consecutiva	17	2		4	1	1
Total	33	2		27	3	1
Ratio per thousand	142.24	8.62		152.54	16.96	5.64
Number of sick days	589			155		
Average number sick daily	1.61			.42		
Av. number sick daily per thousand ..	6.93			2.37		
Average duration of treatment	17.84			5.74		
B.—LOCAL DISEASES.						
I.—DISEASES OF THE NERVOUS SYSTEM.						
Cephalalgia						
Dementia	1	1				
Dysphonia						
Epilepsia	1	1		1		
Irritatio spinalis	1					
Melancholia				1	1	
Nausea marina						
Neuralgia	8			9	2	
Paralysis	2	1				

dead, for each disease, on each vessel on the Pacific Station.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
7												2			
1	1			3				2				1			
5				9								7	1		
				1	1			1	1			1	1		
												1	1		
13	1			13	1			3	1			12	3		
71.03	5.46			77.84	5.98			75.	25.			88.88	22.22		
61				50				7				69			
.16				.27				.01				.18			
.87				1.61				.25				1.33			
4.69				3.07				2.33				5.75			
3				1	1										
1															
7	1			3								1			
				5				1	1			1			
				1	1									1	
12	1			2				1	1			1	1		
4	1			7	1							6	4	2	
27	3			19	3			2	2			10	5	3	
147.54	16.39			113.77	17.96			50.	50.			74.07	37.03	22.22	
519				272				14				28			
1.42				1.47				.03				.07			
7.75				8.80				.76				.51			
19.22				14.31				7.				2.08			
1				6											
				1											
2	1											1		1	
2				1											
				10								4	1		

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
I.—DISEASES OF THE NEVOUS SYSTEM.—Continued.								
Pleurodynia.....	2							
Vertigo								
Total.....	15	3			11	3		
Ratio per thousand.....	64. 65	12. 93			62. 14	16. 96		
Number of sick days.....	168				64			
Average number sick daily.....	. 46				. 17			
Av. number sick daily per thousand...	1. 98				. 96			
Av. duration of treatment.....	11. 02				5. 81			
II.—DISEASES OF THE EYE.								
Conjunctivitis.....					1			
Iritis.....	1							
Ophthalmia gonorrhoeica.....								
Ophthalmia tarsi								
Retinitis					1	1		
Total.....	1				2	1		
Ratio per thousand.....	4. 31				11. 29	5. 64		
Number of sick days.....	7				16			
Average number sick daily.....	. 01				. 04			
Av. number sick daily per thousannd.	. 04				. 22			
Average duration of treatment.....	7. 00				8. 00			
III.—DISEASES OF THE EAR.								
Otalgia.....								
Otitis								
Otorrhœa.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
Average nnmber sick daily.....								
Av. number sick daily per thousand...								
Average duration of treatment.....								

for each disease, on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1				1								1			
6	1			21								6	1	1	
32.67	5.46			125.74								44.44	7.40	7.40	
71				147								44			
.19				.79								.12			
1.03				4.73								.88			
11.83				7.00								7.33			
1				4				2							
1				1	1										
2				5				2							
10.92				29.94				50.00							
52				25				4							
.14				.13				.01							
.76				.77				.25							
26.00				5.00				2.00							
				1								1			
				4								1			
				5								2			
				29.94								14.81			
				19								3			
				.10											
				.59											
				3.8								1.5			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IV.—DISEASES OF THE TEETH.								
Odontalgia								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
Average number sick daily.....								
Av. number sick daily per thousand...								
Average duration of treatment.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Angina pectoris.....					1	1		
Morbi val. cordis								
Palpitatio.....					2	1		
Total.....					3	2		
Ratio per thousand.....					16.96	11.29		
Number of sick days.....					18			
Average number sick daily.....					.04			
Av. number sick daily per thousand...					.22			
Average duration of treatment.....					6			
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	1							
Bronchitis acuta	6				3			
Bronchitis chronica					3	1		
Catarrhus	2				9	1		
Hæmoptysis.....					1			
Laryngitis					3	1		
Phthisis pneumonica chronica	1	1			3	3		
Pleuritis	1	1			1			
Pneumonia.....	5	1						
Total.....	16	3			23	6		
Ratio per thousand.....	68.53	12.93			129.94	33.89		
Number of sick days.....	241				180			
Average number sick daily.....	0.66				0.49			
Av. number sick daily per thousand...	2.84				2.76			
Average duration of treatment.....	15.00				7.82			

for each disease on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1												1	.....	.....	.....
1												1	.....	.....	.....
5.46												7.40	.....	.....	.....
4												1	.....	.....	.....
.01															
.05															
4.												1	.....	.....	.....
.....															
3	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
3	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
16.39	10.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14.81	.....	.....	.....
125												10	.....	.....	.....
.34												.02	.....	.....	.....
1.85												.14	.....	.....	.....
41.66												5	.....	.....	.....
.....															
.....				1	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....
.....				8	.....	.....	.....	.....	.....	.....	.....	11	3	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
17				14	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....
.....															
3	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	3	2	.....	.....
3				3	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
.....				1	.....	.....	1	.....	.....	.....	.....	1	1	.....	.....
23	2	.....	.....	30	.....	.....	1	.....	.....	.....	.....	30	6	1	.....
124.59	10.92	.....	.....	179.64	.....	.....	5.98	.....	.....	.....	.....	222.22	44.44	7.40	.....
201				368	.....	.....	.....	.....	.....	.....	.....	211	.....	.....	.....
.55				2.00	.....	.....	.....	.....	.....	.....	.....	.57	.....	.....	.....
3.00				11.97	.....	.....	.....	.....	.....	.....	.....	4.22	.....	.....	.....
8.73				12.66	.....	.....	.....	.....	.....	.....	.....	7.03	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Ascites								
Cholera morbus					1			
Colica					1			
Congestio hepatis	2							
Constipatio								
Diarrhœa acuta	3				12			
Dysenteria acuta	2				1			
Dyspepsia	1							
Fistula in ano	2	1						
Gastritis	1							
Hæmorrhoids	1				3	1		
Hepatitis chronica								
Hernia					1	1		
Icterus	2	1			2	1		
Peritonitis								
Pharyngitis	1							
Tonsillitis	2				8			
Vermes					1			
Total	17	2			30	3		
Ratio per thousand	73.27	8.62			169.49	16.96		
Number of sick days	108				127			
Average number sick daily	.29				.34			
Av. number sick daily per thousand	1.25				1.92			
Average duration of treatment	6.35				4.23			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Chancroides	6							
Enuresis								
Gonorrhœa	7	1			1			
Hæmaturia								
Orchitis	4				6	1		
Paraphymosis								
Urethræ strictura	1		1		2			
Varicocele								
Total	18	1	1		9	1		
Ratio per thousand	77.58	4.31	4.31		50.84	5.64		
Number of sick days	285				80			
Average number sick daily	.78				21			
Average number sick daily per thousand	5.90				1.18			
Average duration of treatment	15.83				8.8			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....								
Synovitis.....					1			
Total.....					1			
Ratio per thousand.....					5.64			
Number of sick days					7			
Average number sick daily					.61			
Average number sick daily per thousand					.05			
Average duration of treatment.....					7			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abcessus.....	5	1						
Erythema	1							
Furunculus	8				6			
Herpes					1	1		
Paronychia.....					6	1		
Pemphigus.....	2							
Scabies								
Tinea	1							
Ulcer	1							
Total.....	18	1			13	2		
Ratio per thousand.....	77.58	4.31			73.44	11.29		
Number of sick-days	265				99			
Average number of sick daily	.72				.27			
Av. number of sick daily per thousand.....	3.16				1.52			
Average duration of treatment.....	14.72				7.61			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis								
Ratio per thousand.....								
Number of sick-days								
Average number of sick daily.....								
Av. number of sick daily per thousand.....								
Average duration of treatment								

for each disease, on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.			Cases.	Invalided.			Cases.	Invalided.			Cases.	Invalided.		
	To hospital.	From service.	Dead.		To hospital.	From service.	Dead.		To hospital.	From service.	Dead.		To hospital.	From service.	Dead.
1												1			
1												1			
5.46												7.40			
2												4			
												.01			
												.07			
2												4			
4				4				1				9	1		
9				5				1				3			
1												1			
												16	8		
												1			
3				7								4	3		
17				16				2				34	12		
92.89				95.80				50.00				251.85	88.88		
105				180				25				274			
.28				.97				.06				.75			
1.53				5.80				1.50				5.55			
6.17				11.25				12.05				8.05			
4				1	1							2	1		
21.85				5.98	5.98							14.81	7.40		
155				7								4			
.42				.03								.01			
2.29				.17								.07			
38.75				7.00								2.00			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Cystitis								
Sarcoma								
Total								
Ratio per thousand								
Number of sick-days								
Average number of sick daily								
Av. number of sick daily per thousand								
Average duration of treatment								
C.—POISONS.								
Alcoholismus	2				2			
Ebriositas								
Vulnus venenatum								
Total	2				2			
Ratio per thousand	8.62				4.29			
Number of sick days	6				4			
Average number sick daily	.01				.01			
Av. number sick daily per thousand ..	.04				.05			
Average duration of treatment	3				2			
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio					3			
Ambustio					2			
Concussio cerebri	1			1				
Concussio spinalis								
Contusio	11				6	2		
Fractura	4	2			3	2		
Stemma	3				5			
Vulnus contusum	8				7			
Vulnus incisum	6	1			4			
Vulnus laceratum	4				3			
Vulnus punctum	2				2			
Total	39	3		1	35	4		
Ratio per thousand	168.10	12.93		4.31	197.74	22.58		
Number of sick days	413				307			
Average number sick daily	1.13				.84			
Av. number sick daily per thousand ..	4.87				4.74			
Average duration of treatment	10.58				8.77			

for each disease, on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....												1	.....	.....	.....
.....												1	.....	.....	.....
.....												2	.....	.....	.....
.....												14.81	.....	.....	.....
.....												19	.....	.....	.....
.....												.05	.....	.....	.....
.....												.37	.....	.....	.....
.....												9.05	.....	.....	.....
.....															
6				2	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....								3	.....	.....	.....	.....	.....	.....	.....
6				3	.....	.....	.....	3	.....	.....	.....	3	.....	.....	.....
32.67				17.96	.....	.....	.....	75	.....	.....	.....	22.22	.....	.....	.....
23				6	.....	.....	.....	6	.....	.....	.....	3	.....	.....	.....
.05				.03	.....	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....
.27				.17	.....	.....	.....	.25	.....	.....	.....	.....	.....	.....	.....
3.83				2	.....	.....	.....	2	.....	.....	.....	1	.....	.....	.....
.....															
4												4	.....	.....	.....
3															
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9				7	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....
6	2	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
5				19	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....
1				2	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....
2				4	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....
3				2	.....	.....	.....	.....	.....	.....	.....	5	1	.....	.....
3				2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
36	2	.....	.....	38	.....	.....	.....	3	.....	.....	.....	24	1	.....	.....
196.71	10.92	.....	.....	227.54	.....	.....	.....	75	.....	.....	.....	177.77	7.40	.....	.....
311				390	.....	.....	.....	40	.....	.....	.....	178	.....	.....	.....
.85				2.11	.....	.....	.....	.10	.....	.....	.....	.48	.....	.....	.....
4.64				12.63	.....	.....	.....	2.50	.....	.....	.....	3.51	.....	.....	.....
8.63				10.26	.....	.....	.....	13.33	.....	.....	.....	74.16	.....	.....	.....

TABLE III.—*Showing the number of cases, the invalided and dead,*

Vessels or stations.....	Alaska.				Adams.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From serv	
E.—FEIGNED DISEASES.								
Rhenmatismus								
Morbus cordis.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
Average number sick daily.....								
Grand total.....	185	17	1	1	189	27	2	.....
Ratio per thousand.....	797. 41	73. 21	4. 31	4. 31	1, 067. 79	152. 54	11. 29	.....
Number of sick days	2, 270	.....	.....		1, 253	.....	.....	.....
Average number sick daily.....	6. 21	.....	.....		3. 43	.....	.....	.....
Av. number sick daily per thousand ..	26. 76	.....	.....		19. 32	.....	.....	.....
Average duration of treatment.....	12. 27	.....	.....		6. 75	.....	.....	.....

for each disease, on each vessel on the Pacific Station—Continued.

Essex.				Hartford.				Hassler.				Independence.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....												2	.....	.....	.....
.....												1	.....	.....	.....
.....												3	.....	.....	.....
.....												22.22	.....	.....	.....
.....												.16	.....	.....	.....
.....												1.18	.....	.....	.....
188	14	.....	.....	187	10	.....	1	20	3	.....	.....	164	34	5	.....
1,027.32	76.50	.....	.....	1,119.75	59.88	.....	5.98	500	75	.....	.....	1,214.81	251.853	7.03	.....
2,043				1,771	.....	.....	.....	104	.....	.....	.....	1,064	.....	.....	.....
5.59				9.62	.....	.....	.....	.28	.....	.....	.....	2.91	.....	.....	.....
30.55				57.60	.....	.....	.....	7	.....	.....	.....	21.55	.....	.....	.....
10.81				9.46	.....	.....	.....	5.20	.....	.....	.....	6.48	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Iroquois.				Lackawanna.				McArthur.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.												
I.—ZYMOTIC DISEASES.												
Erysipelas					1							
Febricula												
Febris continua simplex	8								1			
Febris enterica	1											
Febris intermittens	9				33				1			
Febris remittens	1											
Morbilli									1	1		
Vaccina	2											
Total.....	21				34				3	1		
Ratio per thousand.....	192. 66				153. 84				93. 75	31. 25		
Number of sick days	127				119				7			
Average number sick daily.....	. 48				. 32				. 01			
Av. number sick daily per thousand.	4. 40				1. 44				. 31			
Average duration of treatment.....	6. 04				3. 05				2. 33			
II.—CONSTITUTIONAL DISEASES.												
Adynamia	7	1			1							
Lumbago	1											
Rheumatismus acutus	8				4							
Rheumatismus chronicus					3							
Scrofula	1	1										
Syphilis primitiva.....	3				11							
Syphilis consecutiva	2				18	3						
Torticollis.....												
Total.....	22	2			37	3						
Ratio per thousand.....	201. 83	18. 34			167. 42	13. 57						
Number of sick days	185				604							
Average number sick daily	. 70				1. 65							
Av. number sick daily per thousand.	6. 42				7. 46							
Average duration of treatment.....	8. 40				16. 32							

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Iroquois.			Lackawanna.				McArthur.			
Diseases and injuries.	Cases.	Invalided.		Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service. Dead.		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES.											
I.—DISEASES OF THE NERVOUS SYSTEM.											
Cephalalgia				1							
Convulsio	1	1									
Dementia	1	1									
Epilepsia											
Hysteria								1	1		
Insolatio	2										
Melancholia											
Meningitis											
Nausea marina	1										
Neuralgia	1	1		4							
Paralysis				5	1						
Pleurodynia	1										
Vertigo											
Total	7	3		10	1			1	1		
Ratio per thousand	64.22	27.52		45.24	4.52			31.25	31.25		
Number of sick days	169			70				1			
Average number sick daily	.64			.19							
Av. number sick daily per thousand	5.87			.85							
Average duration of treatment	24.14			7.00				1.00			
II.—DISEASES OF THE EYE.											
Asthenopia				1							
Conjunctivitis				1							
Dacrocystitis											
Hemeralopia	2	1									
Retinitis	2	1		1	1						
Ulcus cornea				1							
Total	4	2		4	1						
Ratio per thousand	36.68	18.34		18.09	4.52						
Number of sick days	42			53							
Average number sick daily	.15			.14							
Av. number sick daily per thousand	1.37			.63							
Average duration of treatment	10.05			13.25							

for each disease, on each vessel on the Pacific Station—Continued.

Onward.				Pensacola.				Ranger.				Wachusett.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
				9				2				1			
												1	1		
								2							
				1	1							2			
				1			1								
				2				1				5			
				1											
				2				2							
				2				1				3	1		
				18	1		1	8				12	2		
				46.15	2.56		2.56	61.53				71.42	11.90		
				122				27				137			
				.33				.07				.37			
				.84				.53				2.20			
				6.77				3.37				11.41			
								1				4	1		
												1	1		
				1								1	1		
				1				1				6	3		
				2.56				7.69				35.71	17.85		
				61				2				29			
				.16								.07			
				.41								.41			
				61.00				2.00				4.83			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations.....	Iroquois.				Lackawanna.				McArthur.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Cont'd.												
III.—DISEASES OF THE EAR.												
Otalgia.....					1							
Otitis.....												
Surditas.....	1	1										
Total.....	1	1			1							
Ratio per thousand.....	9.17	9.17			4.52							
Number of sick days.....	1				2							
Average number sick daily.....												
Av. number sick daily per thousand.....												
Average duration of treatment.....	1				2							
IV.—DISEASES OF THE TEETH.												
Odontalgia.....												
Parulis.....												
Total.....												
Ratio per thousand.....												
Number of sick days.....												
Average number sick daily.....												
Av. number sick daily per thousand.....												
Average duration of treatment.....												
V.—DISEASES OF THE CIRULATORY SYSTEM.												
Aneurysma.....					2	2						
Angina pectoris.....	1	1										
Morbi val. cordis.....	1	1			1	1						
Palpitatio.....	1				1							
Phlebitis.....												
Varix.....												
Total.....	3	2			4	3						
Ratio per thousand.....	27.52	18.34			18.09	13.57						
Number of sick days.....	77				127							
Average number sick daily.....	.29				.35							
Av. number sick daily per thousand.....	2.66				1.58							
Average duration of treatment.....	25.66				31.75							

for each disease, on each vessel on the Pacific Station—Continued.

Onward.				Pensacola.				Ranger.				Wachusett.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....				2								1			
.....												1			
.....												1			
.....				2								3			
.....				5.12								17.85			
.....				8								16			
.....				.02								.04			
.....				.05								.23			
.....				4								5.33			
.....															
.....				1				2							
.....				1				2							
.....				2.56				15.38							
.....				3				6							
.....								.01							
.....								.07							
.....				3				3							
.....															
.....				1	1							1	1		
.....								1	1			1			
.....												1			
.....												1	1		
.....				1	1			1	1			3	2		
.....				2.56	2.56			7.69	7.69			17.85	11.90		
.....				44				1				64			
.....				.12								.17			
.....				.30								1.01			
.....				44				1				21.33			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Iroquois.			Lackawanna.				McArthur.			
Diseases and injuries.	Cases.	Invalided.		Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service. Dead.		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Cont'd.											
VI.—DISEASES OF THE RESPIRATORY SYSTEM.											
Asthma				4							
Bronchitis acuta	1			10							
Bronchitis chronica											
Catarrhus				7							
Hæmoptysis											
Laryngitis								1	1		
Phthisis pneumonica acuta											
Phthisis pneumonica chronica	1	1									
Pleuritis				1							
Pneumonia	1	1		1							
Total	3	2		23				1	1		
Ratio per thousand	27.52	18.34		104.07				31.25	31.25		
Number of sick days	9			132				1			
Average number sick daily	.03			.36							
Av. number sick daily per thousand	.27			1.62							
Average duration of treatment	.3			5.73				1			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.											
Cholera morbus	3			5							
Colica				7							
Constipatio	1			4							
Diarrhœa acuta	1			25				1			
Diarrhœa chronica				1							
Dysentery acuta	1			11			1				
Dysentery chronica											
Dyspepsia											
Hæmorrhoids				1							
Hepatitis chronica											
Hernia				1							
Icterus	2										
Peritonitis											
Pharyngitis	2										
Tonsillitis	3			1							
Typhlitis											
Total	13			56			1	1			
Ratio per thousand	119.26			253.39			4.52	31.25			
Number of sick days	112			342				2			
Average number sick daily	.42			.93							
Av. number sick daily per thousand	3.85			4.20							
Average duration of treatment	8.61			6.10				2.			

for each disease, on each vessel on the Pacific Station—Continued.

Onward.				Pensacola.				Ranger.				Wachusett.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1				17								6			
				1								2	1		
				20				5				11			
				1	1			1							
								1	1			1	1		
								1		1		3	2		
				1			1					1			1
1				40	1		1	8	1	1		24	4		1
27.02				102.56	2.56		2.56	61.53	7.69	7.69		142.84	23.80		5.95
5				400				38				281			
.01				1.09				.10				.76			
.27				2.79				.76				4.52			
5.				10.				4.75				11.70			
				3				2				2			
				4				5				2			
				2				1							
				8				2							
								1	1			1	1		
1		1		4				3	1			1			
				1								2			
												1			
1				3	1										
				3											
				5				2				3			
				1											
2		1		34	1			16	2			12	1		
54.05	27.02			87.17	2.56			123.06	15.38			71.42	5.95		
27				130				59				93			
.07				.35				.16				.25			
1.89				.89				1.23				1.48			
13.5				3.82				3.68				7.75			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Iroquois.				Lackawanna.				McArthur.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Cont'd.												
VIII.—DISEASES OF THE GENITO- URINARY SYSTEM.												
Albuminuria					1							
Colica nephritica	1											
Chancroides	2											
Cystitis												
Gonorrhœa	2				7							
Hæmaturia												
Orchitis					8							
Paraphymosis					1							
Phymosis												
Urethræ strictura												
Varicocele					1							
Total	5				18							
Ratio per thousand	45.87				81.44							
Number of sick days	65				153							
Average number sick daily	.23				.41							
Av. number sick daily per thousand.	2.11				1.85							
Average duration of treatment	13				8.5							
IX.—DISEASES OF THE LOCOMO- TIVE SYSTEM.												
Hydrops articuloꝝ					1							
Necrosis												
Synovitis	1											
Total	1				1							
Ratio per thousand	9.17				4.52							
Number of sick days	8				4							
Average number sick daily	.03				.01							
Av. number sick daily per thousand.	.27				.04							
Average duration of treatment	8				4							

for each disease, on each vessel on the Pacific Station—Continued.

Onward.				Pensacola.				Ranger.				Wachusett.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
3				6				4							
1				1				1				9			
				5											
				1				2				2			
				13											
				1				1				1			
								1							
4				27				9				12			
108.10				69.23				69.23				71.42			
30				323				129				190			
.08				.88				.35				.52			
2.16				2.25				2.69				3.09			
7.5				11.96				14.33				15.83			
				1											
				1											
				2.56											
				3											
				3											

TABLE III.—*Showing the number of cases, the invalided and dead.*

[illegible]

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations.	Iroquois				Lakawanna.				McArthur.			
	Invalided.		Dead.		Invalided.		Dead.		Invalided.		Dead.	
Diseases and injuries	Cases.	To hospital.			Cases.	To hospital.			Cases.	To hospital.		
		From service.				From service.				From service.		
C.—POISONS.												
Alcoholismus					3							
Colica pictonum					1							
Ebriositas					1							
Vulnus venenatum												
Total					5							
Ratio per thousand					22.62							
Number of sick days					17							
Average number sick daily					.04							
Av. number sick daily per thousand					.18							
Average duration of treatment					3.4							
D.—VIOLENT DISEASES AND DEATHS.												
Abrasio					2							
Ambustio	1				2							
Contusio	8				6							
Fractura	2	1			1							
Luxatio												
Stemma	6				24				1			
Vulnus contusum	5				1							
Vulnus incisum	2				2							
Vulnus laceratum	3				9							
Vulnus punctum												
Vulnus sclopetarium												
Total	27	1			47				1			
Ratio per thousand	247.70	9.17			212.66				31.25			
Number of sick days	110				393				2			
Average number sick daily	.41				1.07							
Av. number sick daily per thousand	3.76				4.84							
Average duration of treatment	4.07				8.36				2			
Grand total	117	16			267	8	1		7	3		
Ratio per thousand	1,073.39	146.78			1,208.14	36.19	4.52		218.75	93.75		
Number of sick days	1,056				2,221				13			
Average number sick daily	4				6.08				.03			
Av. number sick daily per thousand	36.69				27.51				.93			
Average duration of treatment	9.02				8.31				1.85			

for each disease, on each vessel on the Pacific Station—Continued.

Onward.				Pensacola.				Ranger.				Wachusett.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....			..	1	.....	.....	.....	4	.....	.....	..	3	.....	.....	.....
.....			..								..				
.....			..	1	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	.....
.....			..	2	.....	.....	.....	4	.....	.....	..	3	.....	.....	.....
.....			..	5.12	.....	.....	.....	30.76	.....	.....	..	17.85	.....	.....	.....
.....			..	14	.....	.....	.....	11	.....	.....	..	10	.....	.....	.....
.....			..	.03	.....	.....	.....	.03	.....	.....	..	.02	.....	.....	.....
.....			..	.08	.....	.....	.....	.23	.....	.....	..	.11	.....	.....	.....
.....			..	7	.....	.....	.....	2.75	.....	.....	..	3.33	.....	.....	.....
.....			..								..				
1			..	4	.....	.....	.....	1	.....	.....	..	1	.....	.....	.....
.....			..	4	.....	.....	.....	1	.....	.....	..	2	.....	.....	.....
.....			..	20	.....	.....	.....	12	.....	.....	..	17	.....	.....	.....
.....			..	4	1	.....	.....	1	.....	.....	..	1	1	.....	.....
.....			..								..	1	1	.....	.....
.....			..	15	.....	.....	.....	1	.....	.....	..	6	.....	.....	.....
2			..	5	.....	.....	.....	7	.....	.....	..	3	.....	.....	.....
.....			..	2	.....	.....	.....	2	.....	.....	..	1	.....	.....	.....
.....			..	1	.....	.....	.....	.....	.....	.....	..	2	.....	.....	1
.....			..	4	.....	.....	.....	3	.....	.....	..	2	.....	.....	.....
.....			..	2	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	.....
3			..	61	1	.....	.....	28	.....	.....	..	36	2	.....	1
81.08			..	156.41	2.56	.....	.....	215.37	.....	.....	..	214.28	11.90	.....	5.95
24			..	616	.....	.....	.....	244	.....	.....	..	282	.....	.....	.....
.06			..	1.68	.....	.....	.....	.66	.....	.....	..	.77	.....	.....	.....
1.62			..	4.30	.....	.....	.....	5.07	.....	.....	..	4.58	.....	.....	.....
8			..	10.09	.....	.....	.....	8.71	.....	.....	..	7.83	.....	.....	.....
29	2	1	..	300	8	.....	3	188	16	1	..	180	23	1	2
783.78	54.05	27.02	..	769.23	20.51	.....	7.69	1,446.15	123.06	7.69	..	1,071.42	136.90	5.95	11.90
394			..	3,161	.....	.....	.....	1,302	.....	.....	..	1,708	.....	.....	.....
1,07			..	8.66	.....	.....	.....	3.56	.....	.....	..	4.67	.....	.....	.....
28.91			..	22.20	.....	.....	.....	27.38	.....	.....	..	27.79	.....	.....	.....
13.58			..	10.53	.....	.....	.....	6.92	.....	.....	..	9.54	.....	.....	.....

TABLE IV.—Showing the number of cases, the invalided and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 829.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas	1	1.20						
Febricula	8	9.65						
Febris continua simplex.....	9	10.85	1	1.20				
Febris enterica.....	2	2.41	1	1.20			1	1.20
Febris intermittens	53	63.93						
Febris remittens	9	10.85	1	1.20				
Morbilli.....	2	2.41	2	2.41				
Vaccina	10	12.06						
Total.....	94	113.38	5	6.03			1	1.20
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	11	13.26	2	2.41				
Anæmia	1	1.20						
Lumbago.....	1	1.20						
Rheumatismus acutus.....	14	16.88	1	1.20				
Rheumatismus chronicus	13	15.68						
Scrofula.....	1	1.20	1	1.20				
Syphilis primitiva.....	33	39.80	1	1.20				
Syphilis consecutiva	38	45.83	1	8.44				
Torticollis.....								
Total.....	112	135.10	12	14.47				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	11	13.26						
Convulsio								
Dementia								
Dysphonia								
Epilepsia.....	5	6.03	1	1.20	1	1.20		
Hysteria								
Insolatio	2	2.41						
Melancholia								
Meningitis	1	1.20					1	1.20
Nausea marina	4	4.82						
Neuralgia	15	18.09	1	1.20				
Paralysis								
Pleurodynia	1	1.20						
Vertigo.....								
Total.....	39	47.08	2	2.41	1	1.20	1	1.20
II.—DISEASES OF THE EYE.								
Asthenopia.....	1	1.20						
Conjunctivitis.....	1	1.20						
Dacrocystitis.....								
Iritis.....	1	1.20						
Ophthalmia gonorrhœica.....	1	1.20						
Ophthalmia tarsi	1	1.20	1	1.20				
Retinitis	1	1.20						
Total.....	6	7.23	1	1.20				
III.—DISEASES OF THE EAR.								
Otalgia	3	3.61						
Otitis.....	3	3.61						
Otorrhœa.....	4	4.82						
Surditas.....	1	1.20						
Total.....	11	13.26						

TABLE IV.—Showing the number of cases, the invalided and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force 829.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
IV.—DISEASES OF THE TEETH.								
Odontalgia	2	2.41	.....	.....	.....	.....	.....	.....
Parulis	1	1.20	.....	.....	.....	.....	.....	.....
Total	3	3.61	.....	.....	.....	.....	.....	.....
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma	1	1.20	1	1.20	.....	.....	.....	.....
Angina pectoris	2	2.41	2	2.41	.....	.....	.....	.....
Morbi valvularum cordis	1	1.20	1	1.20	.....	.....	.....	.....
Palpitatio	4	4.82	1	1.20	.....	.....	.....	.....
Phlebitis	1	1.20	.....	.....	.....	.....	.....	.....
Total	9	10.85	5	6.03	.....	.....	.....	.....
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma	4	4.82	.....	.....	.....	.....	.....	.....
Bronchitis acuta	23	27.74	1	1.20	.....	.....	.....	.....
Bronchitis chronica	2	2.41	1	1.20	.....	.....	.....	.....
Catarrhus	40	48.25	.....	.....	.....	.....	.....	.....
Hæmoptysis	2	2.41	.....	.....	.....	.....	.....	.....
Laryngitis	2	2.41	1	1.20	.....	.....	.....	.....
Phthisis pneumonica acuta	1	1.20	1	1.20	.....	.....	.....	.....
Phthisis pneumonica chronica	6	7.23	4	4.82	.....	.....	.....	.....
Pleuritis	5	6.03	1	1.20	.....	.....	.....	.....
Pneumonia	4	4.82	2	2.41	.....	.....	1	1.20
Total	89	107.35	11	13.26	.....	.....	1	1.20
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Ascites .....	.....	.....	.....	.....	.....	.....	.....	.....
Cholera morbus	2	2.41	.....	.....	.....	.....	.....	.....
Colica	9	10.85	.....	.....	.....	.....	.....	.....
Congestio hepatis	1	1.20	.....	.....	.....	.....	.....	.....
Constipatio	4	4.82	.....	.....	.....	.....	.....	.....
Diarrhœa acuta	27	32.56	.....	.....	.....	.....	.....	.....
Diarrhœa chronica	1	1.20	.....	.....	.....	.....	.....	.....
Dysenteria acuta	8	9.65	.....	.....	.....	.....	.....	.....
Dysenteria chronica	1	1.20	1	1.20	.....	.....	.....	.....
Dyspepsia	2	2.41	.....	.....	.....	.....	.....	.....
Fistula in ano	2	2.41	1	1.20	.....	.....	.....	.....
Gastritis .....	.....	.....	.....	.....	.....	.....	.....	.....
Hæmorrhoids	3	3.61	.....	.....	1	1.20	.....	.....
Hepatitis chronica .....	.....	.....	.....	.....	.....	.....	.....	.....
Hernia	7	8.44	3	3.61	.....	.....	.....	.....
Icterus	5	6.03	3	3.61	.....	.....	.....	.....
Peritonitis .....	.....	.....	.....	.....	.....	.....	.....	.....
Pharyngitis	7	8.44	.....	.....	.....	.....	.....	.....
Tonsillitis	20	24.12	.....	.....	.....	.....	.....	.....
Typhlitis	1	1.20	.....	.....	.....	.....	.....	.....
Vermes	1	1.20	.....	.....	.....	.....	.....	.....
Total	101	121.83	8	9.65	1	1.20	.....	.....

in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force 798.)								BETWEEN 35 AND 45 YEARS. (Mean force 275.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
2	2.50														
2	2.50														
1	1.25	1	1.25					2	7.27	2	7.27				
4	5.01	2	2.50												
3	3.75	2	2.50												
8	10.02	5	6.25					2	7.27	2	7.27				
20	25.06	1	1.25					2	7.27			1	3.63		
2	2.50							15	54.54	1	3.63				
35	43.85	1	1.25					3	10.90	1	3.63				
2	2.50	1	1.25					7	25.45						
3	3.75	2	2.50	1	1.25			2	7.27	2	7.27				
5	6.26	1	1.25					1	3.63	1	3.63				
2	2.50	1	1.25					5	18.18					2	7.27
69	86.47	7	8.77	1	1.25			35	127.27	5	18.18	1	3.63	2	7.2
9	11.27							2	7.27						
6	7.51							1	3.63						
1	1.25							1	3.63						
4	5.01							2	7.27						
23	28.82							8	29.09						
6	7.51							1	3.63						
1	1.25	1	1.25					2	7.27						
4	5.01							1	3.63						
1	1.25	1	1.25												
2	2.50														
5	6.26	1	1.25					2	7.27						
2	2.50														
4	5.01	1	1.25					2	7.27						
3	3.75							1	3.63						
2	2.50														
5	6.26							1	3.63						
17	21.31							4	14.36						
								2	7.27						
95	119.04	4	5.01					30	109.09						

TABLE IV.—Showing the number of cases the invalided and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 829.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria								
Colica nephritica.....								
Chancroides.....	12	14.47	1	1.20				
Cystitis.....	1	1.20						
Enuresis								
Gonorrhœa.....	41	49.46	3	3.61				
Hæmaturia.....	1	1.20						
Orchitis.....	29	34.97	1	1.20				
Paraphymosis.....	2	2.41						
Phymosis								
Urethræ strictura.....								
Varicocele.....	1	1.20						
Total.....	87	104.94	5	6.03				
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....	1	1.20						
Hydrops articulorum.....	1	1.20						
Necrosis.....								
Synovitis.....								
Total.....	2	2.41						
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	29	34.97	3	3.61				
Anthrax								
Ecthyma.....	2	2.41						
Eczema.....	1	1.20						
Erythema.....	1	1.20						
Furunculus.....	29	34.97						
Herpes								
Onychia.....								
Paronychia.....	6	7.23	1	1.20				
Pemphigus.....	2	2.41						
Pernio.....	1	1.20						
Psoriasis.....								
Scabies.....	5	6.03	3	3.61				
Tinea.....	2	2.41						
Ulcus.....	6	7.23	2	2.41				
Urticaria.....								
Verruca.....	1	1.20						
Total.....	85	102.53	9	10.85				
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	32	38.59	2	2.41				
Total.....	32	38.59	2	2.41				
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Cystis.....								
Sarcoma.....	1	1.20						
Total.....	1	1.20						
C.—POISONS.								
Alcoholismus.....	3	3.61						
Colica pictonum.....								
Ebriositas.....								
Vulnus venenatum.....								
Total.....	3	3.61						

in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 798.)								BETWEEN 35 AND 45 YEARS. (Mean force, 275.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	1.25														
1	1.25														
9	11.27							4	14.36						
								1	3.63	1	3.63				
16	20.05							1	3.63						
1	1.25														
13	16.29														
1	1.25							4	14.36	2	7.27				
1	1.25														
1	1.25														
44	55.13							10	36.36	3	10.90				
2	2.50														
2	2.50														
9	11.27	2	2.50					1	3.63						
2	2.50							1	3.63						
1	1.25							6	21.81						
24	30.08			1	1.25			4	14.36		3.63				
4	5.01														
2	2.50							2	7.27						
5	6.26							1	3.63						
1	1.25							1	3.63						
									1.00						
1	1.25	1	1.25												
11	13.78	5	6.26												
8	10.02	2	2.50					5	18.18						
								1	3.63						
68	85.21	10	12.53	1	1.25			22	80.00	1	3.63				
20	25.06	6	7.51					4	14.36						
20	25.06	6	7.51					4	14.36						
1	1.25														
1	1.25														
10	12.53							7	25.45						
1	1.25														
								2	7.27						
3	3.75														
14	17.54							9	32.72						

TABLE IV.—Showing the number of cases, the invalided and the dead,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 829.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	9	10.85	.....	.....	.....	.....	.....	.....
Ambustio	9	10.85	.....	.....	.....	.....	.....	.....
Concussio spinalis .....	.....	.....	.....	.....	.....	.....	.....	.....
Contusio	43	53.08	.....	.....	.....	.....	.....	.....
Fractura	7	8.44	2	2.41	.....	.....	.....	.....
Luxatio .....	.....	.....	.....	.....	.....	.....	.....	.....
Stemma	35	42.21	.....	.....	.....	.....	.....	.....
Vulnus contusum	19	22.91	.....	.....	.....	.....	.....	.....
Vulnus incisum	20	24.12	.....	.....	.....	.....	.....	.....
Vulnus laceratum	14	16.88	.....	.....	.....	.....	1	1.20
Vulnus punctum	12	14.47	.....	.....	.....	.....	.....	.....
Vulnus sclopetarium	2	2.41	.....	.....	.....	.....	.....	.....
Total.....	170	205.06	2	2.41	.....	.....	1	1.20
E.—FEIGNED DISEASES.								
Rheumatismus	1	1.20	.....	.....	.....	.....	.....	.....
Hypertrophia cordis	1	1.20	.....	.....	.....	.....	.....	.....
Total.....	2	2.41	.....	.....	.....	.....	.....	.....
Grand total.....	846	1,020.50	62	74.78	2	2.41	4	4.82

in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 798.)								BETWEEN 35 AND 45 YEARS. (Mean force, 275.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
3	3.75	.....	.....	.....	.....	.....	.....	4	14.36	.....	.....	.....	.....	.....	.....
8	10.02	.....	.....	.....	.....	.....	.....	1	3.62	.....	.....	.....	.....	.....	.....
1	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31	38.84	2	2.50	.....	.....	.....	.....	15	54.54	.....	.....	.....	.....	.....	.....
6	7.51	2	2.50	.....	.....	.....	.....	7	25.45	3	10.90	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	3.63	1	3.63	.....	.....	.....	.....
36	45.11	.....	.....	.....	.....	.....	.....	16	58.18	.....	.....	.....	.....	.....	.....
15	18.80	.....	.....	.....	.....	.....	.....	7	25.45	.....	.....	.....	.....	.....	.....
5	6.26	1	1.25	.....	.....	.....	.....	3	10.90	.....	.....	.....	.....	.....	.....
9	11.27	.....	.....	.....	.....	.....	.....	7	25.45	1	3.63	.....	.....	.....	.....
5	6.26	.....	.....	.....	.....	.....	.....	1	3.63	.....	.....	.....	.....	.....	.....
.....															
119	149.12	5	6.26	.....	.....	.....	.....	62	125.45	5	18.18	.....	.....	.....	.....
.....															
1	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....															
1	1.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....															
720	902.25	79	98.99	5	6.26	.....	.....	285	1,036.36	23	83.63	2	7.27	2	7.72

TABLE IV.—Showing the number of cases, the iuvalided and the dead,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 94.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febricula								
Febris continua simplex.....	1	10. 63						
Febris enterica								
Febris intermittens.....	6	63. 82						
Febris remittens	1	10 63						
Morbilli								
Vaccina								
Total.....	8	85. 10						
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	1	10. 63						
Anæmia								
Diabetes	2	21. 27						
Lumbago								
Rheumatismus acutus.....	4	42. 55	1	10. 63				
Rheumatismus chronicus.....	8	85. 10	1	10. 63				
Scrofula								
Senectus								
Syphilis primitiva.....								
Syphilis consecutiva	1	10. 63	1	10. 63				
Torticollis								
Total.....	16	170. 21	3	31. 91				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	2	21. 27						
Convulsio								
Dementia	1	10 63	1	10. 63				
Dysphonia								
Epilepsia.....								
Hysteria								
Insolatio								
Irritatio spinalis	1	10. 63						
Melancholia								
Meningitis								
Nausea marina								
Neuralgia	3	31. 91						
Paralysis.....	3	31. 91	1	10. 63				
Pleurodynia.....	1	10. 63						
Vertigo.....	2	21. 27						
Total.....	13	138. 29	2	21. 27				
II.—DISEASES OF THE EYE.								
Asthenopia								
Conjunctivitis.....								
Dacrocystitis.....								
Hemeralopia								
Iritis								
Ophthalmia gonorrhoeica.....								
Ophthalmia tarsi								
Retinitis								
Ulcus cornea.....	2	21. 27	1	10. 63				
Total.....	2	21. 27	1	10. 63				

in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 25.)								TOTALS. (Mean force, 2,021.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
								3	1.48						
								16	7.91						
								22	10.88	2	.98				
								5	2.47	3	1.48			1	.49
1	40.00							150	74.22	1	.49	1	.49		
2	80.00							34	16.82	6	2.96				
								4	1.97	4	1.97				
								17	8.41						
3	120.00							251	124.19	16	7.91	1	.49	1	.49
								27	13.35	6	2.96				
								1	.49						
								2	.98						
1	40.00							7	3.46						
								43	21.27	4	1.97				
4	160.00							51	25.23	2	.98				
								2	.98	2	.98				
1	40.00			1	40			1	.49			1	.49		
								66	32.65	3	1.48				
4	160.00							95	47.00	18	8.90	3	1.48		
								2	.98						
10	400.00			1	40			297	146.95	35	17.31	4	1.97		
1	40.00							20	9.89						
								1	.49	1	.49				
								3	1.48	3	1.48				
								1	.49						
								7	3.46	2	.98	1	.49		
								1	.49	1	.49				
								2	.98						
								1	.49						
								2	.98	2	.98				
								1	.49					1	.49
								6	2.96						
								44	21.77	4	1.97				
								8	3.95	2	.98				
								6	2.96						
								12	5.93	1	.49				
1	40.00							115	56.90	16	7.91	1	.49	1	.49
								1	.49						
								14	6.92	1	.49				
								1	.49	1	.49				
2	80.	1	40					2	.98	1	.49				
								1	.49						
								1	.49						
								1	.49	1	.49				
								5	2.47	3	1.48				
								2	.98	1	.49				
2	80.	1	40					28	13.85	8	3.95				

TABLE IV.—Showing the number of cases, the invalided and the dead,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 94.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv-ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
III.—DISEASES OF THE EAR.								
Otalgia.....								
Otitis.....								
Otorrhœa.....								
Surditas.....								
Total.....								
IV.—DISEASES OF THE TEETH.								
Odontalgia.....								
Parulis.....								
Total.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma.....								
Angina pectoris.....								
Morbi valvularum cordis.....								
Palpitatio.....								
Phlebitis.....								
Varix.....	1	10.63	1	10.63				
Total.....	1	10.63	1	10.63				
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma.....								
Bronchitis acuta.....	2	21.27						
Bronchitis chronica.....	2	21.27						
Catarrhus.....	13	138.29						
Hæmoptysis.....								
Laryngitis.....	1	10.63	1	10.63				
Phthisis pneumonica acuta.....								
Phthisis pneumonica chronica.....								
Pleuritis.....	1	10.63						
Pneumonia.....								
Total.....	19	202.13	1	10.63				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Ascites.....	1	10.63	1	10.63				
Cholera morbus.....	2	21.27						
Colica.....	1	10.63						
Congestio hepatis.....								
Constipatio.....	2	21.27						
Diarrhœa acuta.....	11	117.02						
Diarrhœa chronica.....								
Dysenteria acuta.....	2	21.27					1	10.63
Dysenteria chronica.....								
Dyspepsia.....	3	31.91	1	10.63				
Fistula in ano.....								
Gastritis.....								
Hæmorrhoids.....	1	10.63						
Hepatitis chronica.....								
Hernia.....	6	63.82	1	10.63				
Icterus.....								
Peritonitis.....								
Pharyngitis.....	1	10.63						
Tonsillitis.....	1	10.63						
Typhlitis.....								
Vermes.....								
Total.....	31	329.78	3	31.91			1	10.63

TABLE IV.—Showing the number of cases, the invalided and the dead,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 94.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria.....								
Colica nephritica.....								
Chancroides.....								
Cystitis.....								
Enuresis.....	1	10.63						
Gonorrhœa.....								
Hæmaturia.....								
Orchitis.....								
Paraphymosis.....								
Phymosis.....								
Urethræ strictura.....	2	21.27			1	10.63		
Varicocele.....								
Total.....	3	31.91			1	10.63		
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....								
Hydrops articulorum.....								
Necrosis.....	1	10.63						
Synovitis.....	1	10.63						
Total.....	2	21.27						
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	3	31.91						
Anthrax.....								
Ecthyma.....								
Eczema.....								
Erythema.....								
Furunculus.....								
Herpes.....	1	10.63						
Onychia.....								
Paronychia.....								
Pemphigus.....								
Pernio.....								
Psoriasis.....								
Scabies.....								
Tinea.....								
Ulcus.....								
Urticaria.....								
Verruca.....								
Total.....	4	42.55						
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....								
Total.....								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Cystis.....	1	10.63						
Sarcoma.....								
Total.....	1	10.63						
C.—POISONS.								
Alcoholismus.....	5	53.19						
Colica pictonum.....								
Ebriositas.....								
Vulnus venenatum.....	1	10.63						
Total.....	6	63.82						

in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 25.)								TOTALS. (Mean force, 2,021.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
.....															
.....															
1	40.00	.....	.....	.....	.....	.....	.....	1	.49	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								26	12.86	1	.49	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								2	.98	1	.49	.....	.....	.....	.....
.....								58	23.75	3	1.48	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
2	80.00	.....	.....	.....	.....	.....	.....	44	21.77	1	.49	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								7	3.46	2	.98	1	.49	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
3	120.00	.....	.....	.....	.....	.....	.....	147	72.73	8	3.95	1	.49	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								3	1.48	.....	.....	.....	.....	.....	.....
.....								6	2.96	.....	.....	.....	.....	.....	.....
3	120.00	1	40.00	.....	.....	.....	.....	45	22.26	6	2.96	.....	.....	.....	.....
.....								3	1.48	.....	.....	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
3	120.00	.....	.....	.....	.....	.....	.....	62	30.67	.....	.....	1	.49	.....	.....
.....								9	4.45	1	.49	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								13	6.43	1	.49	.....	.....	.....	.....
.....								4	1.97	.....	.....	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								1	.49	1	.49	.....	.....	.....	.....
.....								16	7.91	8	3.95	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								19	9.40	4	1.97	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
6	240.00	1	40.00	.....	.....	.....	.....	185	91.53	21	10.39	1	.49	.....	.....
.....															
.....								56	27.70	8	3.95	.....	.....	.....	.....
.....								56	27.70	8	3.95	.....	.....	.....	.....
.....															
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								3	1.48	.....	.....	.....	.....	.....	.....
1	40.00	.....	.....	.....	.....	.....	.....	26	12.86	.....	.....	.....	.....	.....	.....
.....								1	.49	.....	.....	.....	.....	.....	.....
.....								2	.98	.....	.....	.....	.....	.....	.....
.....								4	1.97	.....	.....	.....	.....	.....	.....
1	40.00	.....	.....	.....	.....	.....	.....	33	16.32	.....	.....	.....	.....	.....	.....

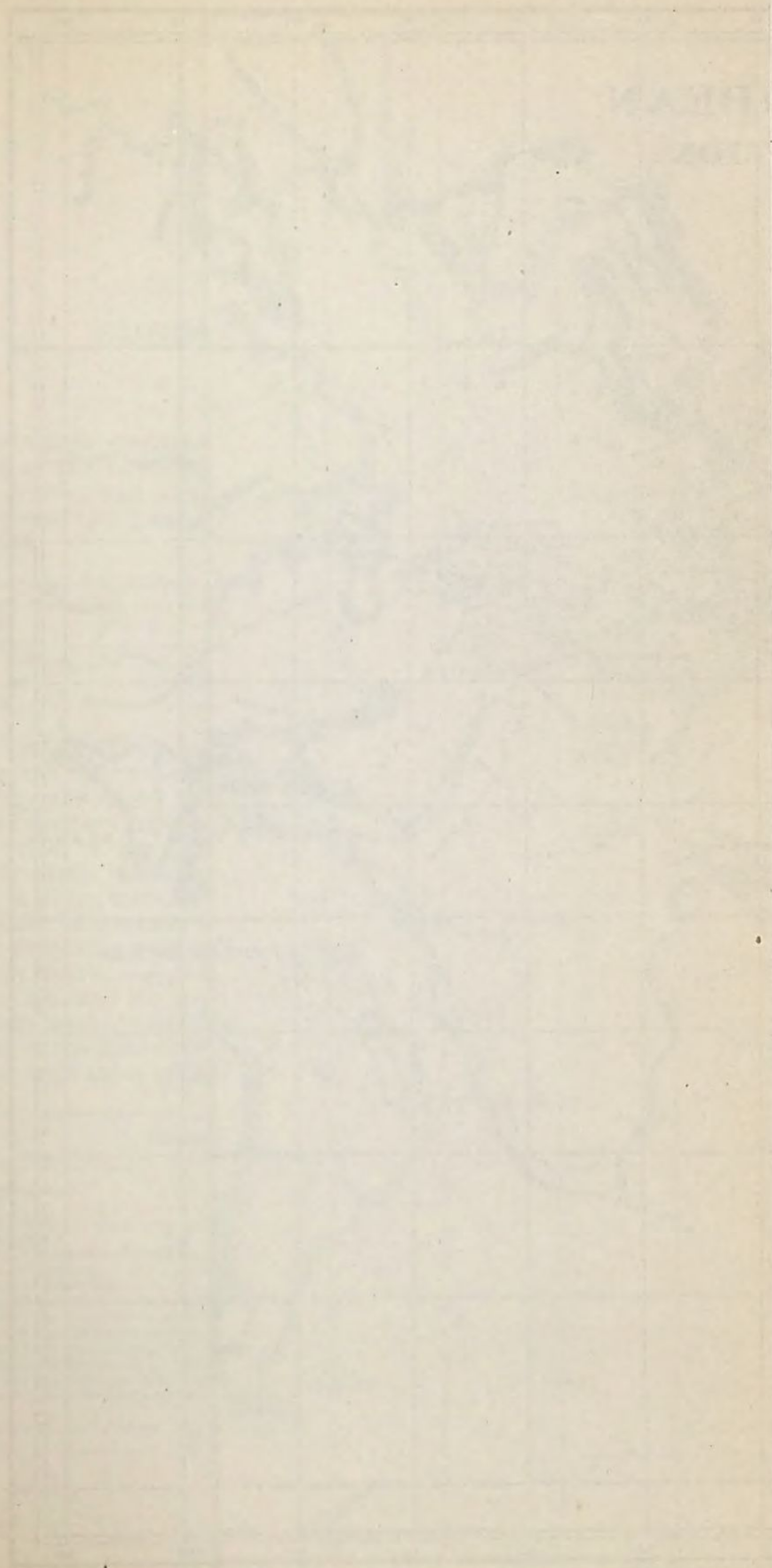
TABLE IV.—*Showing the number of cases, the invalided and the dead,*

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 94.)					
	Cases.		Invalided.			
	Number.	Ratio ‰.	To hospital.		From service.	
			No.	Ratio ‰.	No.	Ratio ‰.
D.—VIOLENT DISEASES AND DEATHS.						
Abrasio						
Ambustio	1	10.63				
Concussio cerebri.						
Concussio spinalis.						
Contusio	10	106.30				
Fractura	3	31.91	2	21.27		
Luxatio						
Stemma	3	31.91				
Vulnus contusum	3	31.91				
Vulnus incisum	1	10.63				
Vulnus laceratum.	1	10.63				
Vulnus punctum						
Vulnus sclopetarium						
Total.....	22	234.04	2	21.27		
E.—FEIGNED DISEASES.						
Rheumatismus						
Hypertrophia cordis.						
Total.....						
Grand total	128	1,361.70	13	138.29	1	10.63

in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 25.)								TOTALS. (Mean force, 2, 021.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
.....	.....	.....	.....	.....	.....	.....	.....	16	7.91	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	19	9.40	.....	.....	.....	.....	.....	.....
1	40	.....	.....	.....	.....	1	40	1	.49	.....	.....	.....	.....	1	.49
.....	.....	.....	.....	.....	.....	.....	.....	1	.49	.....	.....	.....	.....	.....	.....
1	40	.....	.....	.....	.....	.....	.....	100	49.47	2	.98	.....	.....	.....	.....
1	40	.....	.....	.....	.....	.....	.....	24	11.87	9	4.45	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	.49	1	.49	.....	.....	.....	.....
1	40	.....	.....	.....	.....	.....	.....	91	45.02	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	44	21.77	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	29	14.34	1	.49	.....	.....	.....	.....
1	40	.....	.....	.....	.....	.....	.....	32	15.83	1	.49	.....	.....	1	.49
.....	.....	.....	.....	.....	.....	.....	.....	18	8.90	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	2	.98	.....	.....	.....	.....	.....	.....
5	200	.....	.....	.....	.....	1	40	378	187.03	14	6.92	.....	.....	2	.98
.....															
.....	.....	.....	.....	.....	.....	.....	.....	2	.98	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	.49	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	3	1.48	.....	.....	.....	.....	.....	.....
42	1.680	4	160	1	40	1	40	2,021	1,000	181	89.55	11	5.44	8	3.95

SANITARY CONDITION
OF THE
EUROPEAN STATION.





EUROPEAN SQUADRON.

The squadron employed on the European station in the year 1882 consisted of the following vessels: Lancaster, second-rate, flag-ship; Galena, Nipsic, and Quinnebang, third-rates. The strength of the squadron was 1,031, and all the vessels were on the station during the entire year.

The number admitted, including those remaining from last year, was..	978 = 948.59 $\frac{0}{0}$
Discharged, recovered.....	886 = 859.35 $\frac{0}{0}$
Invalided:	
To hospital	47 = 45.58 $\frac{0}{0}$
From service.....	2 = 1.93 $\frac{0}{0}$
Died.....	9 = 8.72 $\frac{0}{0}$
Continued.....	34

These ratios indicate a diminution in the sick rate as compared with last year, the ratio reported for that year having been 12.33.6 $\frac{0}{0}$. The invaliding rate shows a falling off from 54.4 $\frac{0}{0}$ in 1881, while the death rate was increased from 2.4 $\frac{0}{0}$.

The number of sick days was 13.112, more than 1,000 over that of last year; the daily average number sick was, absolute, 35.92, relative, 34.83 $\frac{0}{0}$, a slight increase over those of the preceding year. The average duration of treatment was 13.40 days.

In the English squadron the ratios were: Admissions, — $\frac{0}{0}$; invaliding, — $\frac{0}{0}$; death, — $\frac{0}{0}$. In the German squadron the admission ratio was 1,507.3 $\frac{0}{0}$, and the average duration of treatment 7.4 days.

The daily average number of sick in the various classes of disease is exhibited in the following table, showing the ratios per thousand, as compared with those of the three preceding years :

Diseases.	1879.	1880.	1881.	1882.
GENERAL DISEASES :				
Zymotic	1.07	2.51	1.8	2.17
Constitutional	8.11	3.6	4.68	8.22
LOCAL DISEASES :				
Diseases of the nervous system.....	1.46	1.	.95	2.09
Diseases of the eye	.47	.43	.24	.12
Diseases of the teeth	.38	.01	.02	.....
Diseases of the circulatory system .....	.....	.14	.20	.46
Diseases of the respiratory system.....	3.95	3.51	3.24	5.96
Diseases of the digestive system.....	4.43	2.84	2.35	.....
Diseases of the genito-urinary system	5.81	3.27	3.68	3.76
Diseases of the locomotive system.....	.18	.08	.04	.28
Diseases of the integumentary system	5.37	3.27	2.45	2.13
Diseases of the absorbent system .....	.....	1.32	1.20	.17
POISONS	.33	.19	.15	.20
VIOLENT DISEASES AND DEATHS	5.98	5.83	5.59	4.64

The daily average sick rates of the different ships of the squadron stands in the following order, the ratios per thousand for the previous years also being given:

Ships.	1879.	1880.	1881.	1882.
Quinnebaug.....	35.26	.....	39.57	56.02
Nypsic.....	.....	.....	33.83	50.16
Lancaster.....	.....	.....	13.40	24.53
Galena.....	.....	.....	19.56	22.28

The causes requiring invaliding to hospital are shown in the following table, the ratios being compared with preceding years:

Diseases.	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic.....	2.67	.....	1.93
Constitutional.....	8.03	14.4	8.72
LOCAL DISEASES:			
Diseases of the nervous system.....	3.57	5.6	6.78
Diseases of the circulatory system.....	.89	3.2	3.87
Diseases of the respiratory system.....	10.71	13.6	10.66
Diseases of the digestive system.....	1.78	4.8	6.78
Diseases of the genito-urinary system.....	1.78	4.	.96
Diseases of the integumentary system.....	.....	.8	2.90
VIOLENT DISEASES AND DEATHS.....	7.13	4.8	2.90

The invaliding among the ships occurred in the following order of frequency, the ratios being also given for three antecedent years:

Ships.	1879.	1880.	1881.	1882.
Quinnebaug	4.34	15.17	66.07	76.55
Lancaster.....	.....	.....	83.20	55.15
Nypsic.....	.....	.....	43.71	28.74
Galena.....	.....	.....	12.93	13.15

The deaths occurred from the following causes:

Zymotic diseases.....	2 = 1.92 $\frac{0}{00}$
Diseases of the respiratory system.....	1 = .96 $\frac{0}{00}$
Diseases of the genito-urinary system.....	1 = .96 $\frac{0}{00}$
Diseases from violence.....	5 = 8.72 $\frac{0}{00}$

The deaths occurred on the Galena, Lancaster, and Quinnebaug.

The aggregate of the cases falling under this class reached 84, a ratio of 81.47 $\frac{0}{00}$.

GENERAL DISEASES.

ZYMOTIC GROUP.

The aggregate of cases falling in this group was 84, a ratio of 81.47 $\frac{0}{00}$, a reduction from that of last year, which was 128.0 $\frac{0}{00}$. The daily ratio of sick was 2.17 $\frac{0}{00}$, and the loss of service was 821 days. Of the total, 79 were restored to duty, 2 were invalided, and 2 died, the ratio in each case being 1.93 $\frac{0}{00}$. The average duration of treatment was 9.77 days.

In the English squadron the ratios were: Admissions, — $\frac{0}{00}$; invaliding, — $\frac{0}{00}$; death, — $\frac{0}{00}$. In the German squadron the admission ratio for zymotic and constitutional diseases was 579.7 $\frac{0}{00}$, and the average duration of treatment 9.5 days.

The ratio of cases occurred on the various ships in the following order per thousand, those on former years being also given :

Ships.	1882.
Galena	149.12
Nipsic	101.68
Quinnebaug	81.33
Lancaster	35.96

Erysipelas.—A single case of this disease, occurring on the Quinnebaug, was 31 days under treatment, and was discharged to duty.

Febris continua simplex.—Thirty cases were returned under this head, the ratio of admissions being $29.09\frac{0}{0}$, almost identical with that of last year, which was $30.04\frac{0}{0}$. Of this total 17 occurred on the Galena, 11 on the Nipsic, and 2 on the Quinnebaug. The loss of service was 196 days, and all the cases recovered after an average duration of treatment of 6.53 days.

Febris enterica.—Three cases of typhoid fever occurred on the Galena and 1 on the Quinnebaug, the latter and 1 of the former proving fatal. The ratio of admission was $3.87\frac{0}{0}$, and that of the daily sick $.34\frac{0}{0}$. The loss of service was 122 days. One case was invalided to hospital, and there were 2 deaths.

Febris intermittens.—There were 35 cases of intermittent fever, a ratio of $33.94\frac{0}{0}$ as against $76.0\frac{0}{0}$ last year, showing a large diminution. The Quinnebaug returned the largest number, 13, and the Lancaster had 10. The total loss of service was 196 days, and the daily average sick rate was $.51\frac{0}{0}$. One case was continued, and all the others recovered after an average duration of 5.6 days.

Febris remittens.—Eight cases of remittent fever were returned, of which 6 occurred on the Galena and 1 each on the Nipsic and Lancaster, and the latter was invalided. The admission rate was $7.75\frac{0}{0}$, and that of the daily sick was $.35\frac{0}{0}$. The loss of time amounted to 138 days.

Vaccina.—Only 4 cases of sickness occurred from vaccination, or $3.87\frac{0}{0}$. The loss of service was 63 days, or 15.75 days for each case.

The following table of vaccinations in the squadron exhibits the number and results :

Vessels.	Presenting good cicatrices.		No evidence of previous vaccination.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Galena	19	5	0	2	3	1	30
Lancaster	0	16	0	0	0	0	16
Total	19	21	0	2	3	1	46
Per cent. of cases	86.9		4.3		8.6		.....
Per cent. of successful ...	47.5		0		.75		47.8

Variola.—Two cases of small-pox appeared on the Lancaster, which recovered on board after an average duration of 37.5 days. Prompt vaccination of the crew prevented the extension of the disease.

CONSTITUTIONAL DISEASES.

The number of cases grouped in this class of diseases was 141, giving a ratio of $136.67\frac{0}{0}$, a small reduction from that of last year, which was

147.0 $\frac{0}{0}$. The daily ratio of sick was 38.22 $\frac{0}{0}$, and the loss of service 3,098 days. Nine were invalided to hospital or 8.72 $\frac{0}{0}$, and 1 from the service. Nine were continued for further treatment.

In the English squadron the ratios were: Admission, — $\frac{0}{0}$, invaliding, — $\frac{0}{0}$, death, — $\frac{0}{0}$.

These diseases occurred on the various ships in the following ratios per thousand, compared with those of the preceding years :

Ships.	1879.	1880.	1881.	1882.
Nipsic	13.04	113.51	382.58	293.78
Quinnebaug	13.04	121.73	171.79	157.89
Lancaster			62.40	103.11
Galena			81.89	57.01

Adynamia.—Twenty cases of this affection were included in the returns, their distribution on the ships corresponding in the main to that of intermittent fever, the Nipsic reporting 13 and the Lancaster 6. The case ratio was 19.35 $\frac{0}{0}$, and the daily sick rate 1.41 $\frac{0}{0}$. The loss of service was 533 days, and 4 cases were invalided, or 3.87 $\frac{0}{0}$.

Hydrops.—Two admissions on the Nipsic gave a ratio of 1.93 $\frac{0}{0}$, and an average loss of service of 8 days.

Lumbago.—There were 15 cases of this affection with a ratio of 14.54 $\frac{0}{0}$, and a daily sick rate of .22 $\frac{0}{0}$. The loss of service was 85 days, and all returned to duty excepting 2, who were continued.

Podagra.—One case of gout was returned from the Nipsic, which was restored to duty.

Rheumatismus acutus.—Sixteen cases of acute rheumatism were reported, giving a ratio of 15.51 $\frac{0}{0}$, a falling off from last year, when the rate was 24.8 $\frac{0}{0}$. The number of sick days was 237, and the average duration of treatment 14.81 days. One case was discharged from the service. The disease prevailed most extensively on the Galena and Quinnebaug.

Rheumatismus chronicus.—This disease was noted in 41 cases, ratio of 39.76 $\frac{0}{0}$, as against 44.8 $\frac{0}{0}$ last year, a large majority of the cases (29) occurring on the Nipsic. Two were invalided to hospital, and 3 continued. The loss of service was 602 days, and the average number sick daily 1.59 $\frac{0}{0}$. Thirty-six returned to duty after an average duration of treatment of 14.68 days.

Syphilis primitiva.—Twenty-seven cases of primary syphilis were encountered, giving a ratio of 26.18 $\frac{0}{0}$, a considerable increase over that of last year, which was 19.2 $\frac{0}{0}$. All recovered after an average treatment of 36.81 days, the total loss of time being 994 days, and the daily sick rate 1.59 $\frac{0}{0}$.

Syphilis consecutiva.—There were 19 cases of this affection under observation, a ratio of 18.33 $\frac{0}{0}$, giving a daily sick rate of 1.66 $\frac{0}{0}$, and a loss of 630 days. Three cases were invalided to hospital, a ratio of 2.90 $\frac{0}{0}$. The average duration of treatment was 33.15 days. Eight cases were reported from the Lancaster and 7 from the Nipsic.

LOCAL DISEASES.

DISEASES OF THE NERVOUS SYSTEM.

The cases returned under this head numbered 66, giving a ratio of 64.01 $\frac{0}{0}$, as against 63.2 $\frac{0}{0}$ last year. Of these 57 were returned to duty,

7, or $6.78\frac{0}{0}$, were invalided, and 2 were continued. The loss of service was 789 days, and the daily ratio of sick $2.09\frac{0}{0}$, while the average duration of treatment was 11.95 days.

The ratio of cases of these affections, as distributed among the ships, is given in the following exhibit:

Ships.	1879.	1880.	1881.	1882.
Nipsic.....		140.54	158.45	141.24
Quinnebaug.....	82.60	78.25	74.88	110.04
Galena.....			17.24	43.85
Lancaster.....			27.76	19.18

Cephalalgia.—There were 18 cases of this affection in this squadron, showing a ratio of $17.45\frac{0}{0}$, and a daily sick rate $.07\frac{0}{0}$. The loss of service was 32 days. All recovered after an average of 1.17 days.

Dementia.—The Nipsic reported 2 admissions and 1 invaliding to hospital for this affection.

Mania.—Single cases of this malady were reported from the Lancaster and Quinnebaug, and both were invalided to hospital after an average period of 85 days.

Melancholia.—The Lancaster also returned a case of this disease, which was invalided after being retained on board 115 days.

Nausea marina.—Three cases were reported from the Nipsic and Quinnebaug, with a loss of 11 days.

Neuralgia.—Thirty-one cases of this affection gave a ratio of $30.06\frac{0}{0}$, and a daily ratio of $.90\frac{0}{0}$. The loss of time was 340 days, and 29 cases were restored to duty after an average period of 10.96 days, while 2 were continued.

Paralysis.—The 2 cases of this disease were reported from the Lancaster, and both were invalided.

Pleurodynia.—Six cases, and a ratio of $5.81\frac{0}{0}$ were given from three vessels with a contingent loss of service of 27 days. One was sufficiently severe as to require invaliding to hospital.

Vertigo.—The Quinnebaug reported 1 case, which was 6 days under treatment.

DISEASES OF THE EYE.

There were only 4 cases returned from the squadron under this head, 2 of which were from the Lancaster and 1 from the Galena and Quinnebaug. The Nipsic reported none. The ratio of admissions was $3.87\frac{0}{0}$, and of the daily sick $.12\frac{0}{0}$, while the loss of service was 51 days. There were 2 cases of iritis and 2 of conjunctivitis.

DISEASES OF THE TEETH.

The only case falling under this head was 1 of odontalgia reported from the Nipsic, by which 2 days of service were lost.

DISEASES OF THE CIRCULATORY SYSTEM.

Palpitatio was the only affection mentioned under this head, of which there were 9 cases, a ratio of $8.72\frac{0}{0}$. Four of these occurred on the Nipsic and Quinnebaug, respectively, and 1 on the Lancaster. The loss of service was 176 days, and the average period of treatment was 19.55 days. Three recovered, 4 were invalided to hospital, and 2 were continued.

DISEASES OF THE RESPIRATORY SYSTEM.

There was a total of 133 cases reported in this class, the ratio being $129.0\frac{0}{0}$, a falling off from that of last year, which was $171.2\frac{0}{0}$. The daily average of sick was $5.96\frac{0}{0}$, and the total loss of service was 2,248 days. Eleven were invalided to hospital, a ratio of $10.66\frac{0}{0}$, and there was 1 death; 8 cases were continued. The average duration of treatment was 16.90 days.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $115.9\frac{0}{0}$, and the average duration of treatment 9.7 days.

Diseases of the respiratory system occurred on the various ships in the following ratios per thousand, comparison being made with those of previous years:

Ships.	1879.	1880.	1881.	1882.
Quinnebaug	186.95	117.38	224.67	325.35
Nipsic		383.79	415.86	214.68
Galena			79.58	43.85
Lancaster			41.64	40.76

Asthma.—There were 3 admissions for this affection, 2 on the Galena, and 1 on the Nipsic. The cases recovered after an average duration of 5 days.

Bronchitis acuta.—Twenty-five cases were noted, of which more than one-half occurred on the Galena. The ratio of admissions was $24.24\frac{0}{0}$, as against $32.8\frac{0}{0}$ last year. The loss of service was 388 days, and the daily sick rate $1.02\frac{0}{0}$. One case was continued and the others recovered after an average duration of 15.52 days.

Bronchitis chronica.—There were 15 cases of chronic bronchitis, or $14.54\frac{0}{0}$, and giving a daily ratio of $1.19\frac{0}{0}$. Six were returned to duty, 6 were invalided, and 3 continued. The loss of service was 452 days, and the average duration 30.13 days.

Catarrhus.—An aggregate of 77 cases were returned under this head, contributing a ratio of $74.68\frac{0}{0}$, as against $121.0\frac{0}{0}$ last year, and a loss of 864 days. The ratio of sick daily averaged 228, and the average duration of treatment was 11.22 days. One case was invalided, and 4 were continued. The Quinnebaug reported 47 cases, the Nipsic 28, and the Galena none.

Phthisis pneumonia acuta.—The Nipsic returned a single case, which was invalided to hospital after 48 days of treatment on board.

Phthisis pneumonia chronica.—Two cases occurred on the Lancaster, 1 of which was invalided to hospital, and the total loss of service was 205 days.

Pleuritis.—Four cases of pleurisy were recorded, 3 of which occurred on the Lancaster and 1 on the Galena. The loss of service was 125 days; all the cases returning to duty.

Pneumonia.—There were 6 cases of pneumonia reported in equal numbers from three ships, the Lancaster, Nipsic, and Quinnebaug. One case was invalided from each of the former ships, and 1 death occurred on the latter. The loss of service was 151 days, and the average daily ratio of sick was $.39\frac{0}{0}$.

DISEASES OF THE DIGESTIVE SYSTEM.

The diseases falling within this class contributed a quota of 148 cases and a ratio of $143.54\frac{0}{0}$, as against $204.0\frac{0}{0}$ last year, showing a decided

reduction for the past two years. The loss of service amounted to 1,313 days, and the daily ratio of sick was $3.68\frac{0}{0}$. Seven cases were invalided to hospital and 1 from the service, and 2 cases were continued. The average duration of treatment was 9.37 days.

In the English squadron the ratios were: Admission, $-\frac{0}{0}$; invaliding, $-\frac{0}{0}$. In the German squadron the admission ratio was $202.9\frac{0}{0}$, and the average duration of treatment 7.1 days.

The ratios of these affections on the various ships stood thus:

Ships.	1879.	1880.	1881.	1882.
Nipsic		356.68	338.76	293.78
Quinnebaug	321.73	173.90	308.35	287.08
Galena			103.44	105.26
Lancaster			27.76	28.77

Cholera morbus.—The only ship reporting cases of this affection was the Quinnebaug, which contributed 5. The ratio was $4.84\frac{0}{0}$, as against $11.2\frac{0}{0}$ last year. They returned to duty after an average period of 5 days.

Colica.—There were 25 cases of this affection, a ratio of $24.24\frac{0}{0}$, as against $27.2\frac{0}{0}$ in 1881. The cases were distributed among three ships, the Lancaster having been exempt. The total loss of time was 14 days, or 2.56 days for each case.

Constipatio.—Three cases were noted on the Quinnebaug and 1 on the Galena, which were under treatment for an average period of 3 days.

Diarrhœa acuta.—The cases reported of this affection numbered 54, and the ratio was $52.37\frac{0}{0}$, a decided falling off from that of last year, $83.2\frac{0}{0}$. The largest number occurred on the Nipsic, 23, and there were 20 on the Quinnebaug. Small numbers were reported from the other ships. The loss of service was 250 days, and the daily average ratio $.65\frac{0}{0}$. One case was continued and the others recovered after an average duration of 4.62 days.

Diarrhœa chronica.—Three cases were recorded on the Quinnebaug and 1 on the Galena, the latter being invalided, while the others recovered, with an average loss of time of 20.25 days.

Dyspepsia.—Nine cases occurred on three ships, the Galena having been exempt. The ratio was $8.72\frac{0}{0}$, and the average daily sick rate $.21\frac{0}{0}$. The loss of service was 374 days, or 20.15 for each case. The cases were invalided.

Fistula in ano.—A single case on the Nipsic was under treatment for 11 days.

Gastritis.—The Lancaster had 1 case of this disease on board which was invalided to hospital.

Hæmorrhoids.—Eight cases were recorded: 4 on the Nipsic, 3 on the Galena, and 1 on the Quinnebaug. All recovered after an average duration of 12.37 days. The ratio of cases was $7.75\frac{0}{0}$, and of the daily sick $.26\frac{0}{0}$.

Hernia.—There were 7 cases of hernia reported, which occurred on the Nipsic and Quinnebaug. From the latter 2 were invalided to hospital, and 1 from the service. The ratio of admissions was $6.78\frac{0}{0}$, and of the daily sick $.70\frac{0}{0}$, while the loss of service was 268 days.

Icterus.—There were 3 admissions for jaundice, with a ratio of $2.9\frac{0}{0}$. Recovery took place, the average period of treatment having been 15.66 days.

Tonsillitis.—The returns show 27 cases of this disease, with a ratio of $26.18\frac{0}{0}$, as against $28.8\frac{0}{0}$ last year, causing the loss of 161 days' service. The daily average ratio of sickness was $.42\frac{0}{0}$, and the average duration of treatment 5.96 days. Nine cases occurred on the Quinnebaug and 11 on the Nipsic.

DISEASES OF THE GENITO-URINARY SYSTEM.

The affections coming within this class furnished 86 cases, and a ratio of $83.11\frac{0}{0}$, as against $97.6\frac{0}{0}$, last year. The loss of service was 1,419 days; the daily average number sick was $3.76\frac{0}{0}$, and the average duration of treatment 16.5 days. All recovered excepting 1 case invalided, 1 death, and 4 continued.

In the English squadron the ratios were: Admissions,— $\frac{0}{0}$; invaliding,— $\frac{0}{0}$; death,— $\frac{0}{0}$. In the German squadron the admission ratio for venereal diseases only was $231.9\frac{0}{0}$, and the average duration of treatment 11.7 days.

The relative frequency of these diseases on the different ships was as follows:

Ships.	1879.	1880.	1881.	1882.
Quinnebaug	321.73	99.99	52.91	95.69
Lancaster.....			41.64	93.52
Nipsic		91.89	60.20	73.44
Galena.....			56.63	61.40

Albuminuria.—There were 2 admissions on the Lancaster and 1 death, the average period of treatment having been 25 days, and the average ratio of sick daily $12\frac{0}{0}$.

Balanitis.—The Quinnebaug reported the 2 cases of this affection, the ratio of which was $1.93\frac{0}{0}$.

Calculus.—The Lancaster and Nipsic each reported a case of this affection, which were, in each case, speedily relieved.

Chancroides.—Nineteen cases of this malady were returned, contributing a ratio of $18.42\frac{0}{0}$ and a loss of 414 days. These figures shows a falling off from those of last year, when the ratio was $24.8\frac{0}{0}$ and the loss 601 days. They occurred chiefly on the Lancaster and Quinnebaug, 12 cases having been reported from the former and 6 from the latter. The Nipsic had but 1, and the Galena was exempt. All recovered except 3 cases, which were still under treatment, and the average duration was 21.75 days.

Cystitis.—Two cases occurred on the Lancaster and 1 on the Nipsic, and the resulting loss of service was 140 days. The admission ratio was $2.90\frac{0}{0}$, and the daily average ratio, $.36\frac{0}{0}$.

Gonorrhœa.—The returns show 24 cases of this malady, giving a ratio of $23.27\frac{0}{0}$, and a loss of service of 416 days. Last year the ratio was $34.4\frac{0}{0}$, and the loss of time 447 days. The Galena had 2 cases, Lancaster 12, Nipsic 1, and the Quinnebaug 9. All recovered after an average duration of 46.66 days.

Orchitis.—The cases of this disease numbered 25, and the ratio was $23.27\frac{0}{0}$. Eight cases occurred on the Galena, 10 on the Lancaster, 7 on the Nipsic, and the Quinnebaug was exempt. The number of sick days was 280, and the daily sick rate was $.73\frac{0}{0}$. Recovery took place after an average duration of 11.2 days.

Paraphymosis.—The Galena and Quinnebaug each reported 1 case, which returned to duty after an average period of 10.2 days.

Prostatitis.—There were 3 admissions on the Galena and 1 on the Quinnebaug, the ratio of which was $3.87\frac{0}{0}$, and the loss of service was 51 days.

Spermatorrhœa.—The Nipsic's returns contained 1 case, which was under treatment 9 days.

Varicocele.—Two cases, occurring on the Nipsic and Quinnebaug, gave a ratio of $1.93\frac{0}{0}$, and a loss of service of 26 days.

DISEASES OF THE LOCOMOTIVE SYSTEM.

This class contained 5 cases, which were supplied by the Galena and Quinnebaug; the former being 2 cases of arthritis, and one of periostitis, and the latter 2 cases of ankylosis. The ratio of admissions was $4.84\frac{0}{0}$, and the loss of service was 109 days. All the cases returned to duty, the average period of treatment having been 21.8 days.

DISEASES OF THE INTEGUMENTARY SYSTEM.

This class of diseases yielded 104 cases, and a ratio of $100.87\frac{0}{0}$, as against $119.2\frac{0}{0}$ last year. The daily average sick rate was $2.13\frac{0}{0}$, and the total loss of service 804 days. Three cases were invalided to hospital, and 2 were continued, while the remainder were discharged after an average period of 7.73 days.

In the English squadron the ratios were: Admissions, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $29.0\frac{0}{0}$, and the average duration of treatment 5.5 days.

The following table shows the relative distribution of these diseases:

Ships.	1879.	1880.	1881.	1882.
Nipsic		113. 51	147. 52	288. 14
Quinnebaug	130. 43	139. 12	193. 82	114. 35
Galena			112. 06	70. 17
Lancaster			27. 76	31. 17

Abscessus.—The Lancaster showed a remarkable exemption from this affection, which is usually largely represented in the returns. Among the other ships 25 cases were mentioned, the ratio being $28.12\frac{0}{0}$, and the resulting loss of service 239 days. One case was invalided to hospital, and 1 continued for treatment. The Quinnebaug had 19 cases, and the Nipsic 9.

Eczema.—The Nipsic reported 4 cases, and the Galena 1, the ratio being $4.84\frac{0}{0}$, while the loss of service was 32 days.

Furunculus.—There were recorded 54 cases of this trouble, of which 31 occurred on the Nipsic, 7 on the Quinnebaug, and 8 on the Galena and Lancaster, respectively. The ratio of cases was $52.37\frac{0}{0}$, as against $44.0\frac{0}{0}$ last year, and the loss of service was 349 days.

Paronychia.—Five cases of this affection were returned from the Nipsic, giving a ratio of $4.84\frac{0}{0}$, and a resulting loss of service of 24 days.

Ulcus.—Eleven cases of ulcer were reported, of which 5 were on the Lancaster. The ratio of admission was $10.66\frac{0}{0}$, and the daily ratio was $.41\frac{0}{0}$. The average duration of treatment was 9.45 days.

DISEASES OF THE ABSORBENT SYSTEM.

Under this head were returned 20 cases of adenitis, which were distributed among three ships, the Lancaster having been exempted. The

loss of service amounted to 316 days, and the ratio of admissions was $19.39\frac{0}{0}$, while the daily sick rate was $.83\frac{0}{0}$. All the cases returned to duty after an average period of 15.8 days.

POISONS.

The cases returned in this class were all of alcoholismus, and all but 1 case occurred on the Quinnebaug. The ratio was $18.42\frac{0}{0}$, and the loss of service 77 days, or 4.05 days for each case.

VIOLENT DISEASES AND DEATHS.

An aggregate of 155 cases were classed under this head, the ratio being $150.33\frac{0}{0}$, and the loss of service 1,750 days. The daily sick rate was $4.64\frac{0}{0}$, and the average duration of treatment 11.29 days. Three cases were invalided, 5 died, and 4 were continued.

In the English squadron the ratios were: Admission, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $130.4\frac{0}{0}$, and the average duration of treatment 5.7 days.

The frequency of the cases resulting from violence is expressed in the following ratios per thousand :

Ships.	1879.	1880.	1881.	1882.
Quinnebaug	291.30	256.52	245.13	248.80
Nipsic		205.40	316.91	158.19
Lancaster			201.26	117.50
Galena			124.99	114.03

Abrasio.—There were 5 cases reported of this injury, making a ratio of $4.84\frac{0}{0}$, as against $15.0\frac{0}{0}$ last year. The loss of service was 48 days.

Ambustio.—Six cases of burn gave a ratio of $5.81\frac{0}{0}$, and a loss of time of 73 days. The daily sick rate was $.19\frac{0}{0}$, and the average duration of treatment 12.16 days. The Quinnebaug had 3 cases, and single cases occurred on the other ships.

Concussio cerebri.—The Quinnebaug reported 3 cases, of which was invalided, and the Lancaster 1 case, which ended fatally. One case remained under treatment. The loss of service was 18 days.

Contusio.—There were 57 cases of this form of injury, giving a ratio of $55.28\frac{0}{0}$, and a loss of service of 366 days. One died, and 1 was invalided to hospital. The daily average sick rate was $.96\frac{0}{0}$, and the average duration 6.42 days.

Fractura.—Seven cases gave ratio of $6.78\frac{0}{0}$, and a loss of 184 days. The daily average ratio of sick was $48\frac{0}{0}$, and the duration of treatment 26.28 days. Two cases were invalided and 1 died.

Stremma.—There were 28 cases of sprain, 2 of which remained under treatment. The ratio of admission was $27.15\frac{0}{0}$, and of the daily sick $1.02\frac{0}{0}$, while the loss of service was 390 days, and the average duration 13.92 days. The Lancaster reported but 1 case, while the Quinnebaug had 14.

Submersio.—A death from drowning occurred on the Lancaster.

Vulnus contusum.—The Lancaster returned 9 cases of contused wounds, and the Nipsic 7. The ratio for 16 cases was $15.51\frac{0}{0}$, and the loss of service 143 days. The average duration of treatment was 8.93 days, and all the cases returned to duty.

Vulnus incisum.—Nine cases of this injury contributed a ratio of $8.72\frac{0}{0}$,

and a loss of 118 days. Eight cases recovered, with an average loss of time of 13.11 days, and 1 was continued.

Vulnus laceratum.—The ratio yielded by 14 cases of this injury was $13.57\frac{0}{00}$, and the loss of service was 375 days. The Galena contributed the largest number, 8; 1 of which was fatal. The average duration of treatment was 25.5 days.

Vulnus punctum.—Four cases of punctured wounds on the Quinnebaug, 2 on the Lancaster and 1 on the Nipsic gave a ratio of $6.78\frac{0}{00}$, and a consequent loss of service of 36 days, all the cases returned to duty.

Vulnus sclopetarium.—The Lancaster returned 1 case of gun-shot wound, which returned to duty after 16 days of treatment.

NAVAL HYGIENE.

GALENA.

At the beginning of the year this vessel was on the coast of Africa. Returning from thence in February, she remained in the Mediterranean until July, when she sailed for the South Atlantic station, touching at Madeira *en route*. She reached Brazil in the last quarter of the year. Her service at sea during the year was 122 days, and she was in port 243 days.

In the zymotic class of diseases there were returned from this ship 34 cases, giving a ratio of $149.12\frac{0}{0}$, a marked diminution from last year, when it was $258.6\frac{0}{0}$. The loss of service was 275 days, and the average daily sick rate was $3.28\frac{0}{0}$. The principal factors of this class were, simple continued fever, 17; intermittent and remittent fevers, of each 6, and 3 of typhoid fever; 1 of the latter was invalided and 1 died, the ratio in each case being $4.38\frac{0}{0}$.

The constitutional cases numbered 13, of which 8 were of rheumatism and 5 of syphilis. The ratio of admissions was $57.01\frac{0}{0}$, and of the daily sick $3.85\frac{0}{0}$. The total loss of service was 323 days, an average of 24.84 for each case.

Ten cases were grouped among nervous affections, giving a ratio of $43.85\frac{0}{0}$ as against $7.24\frac{0}{0}$ last year. The loss of service was 33 days, and there was no invaliding.

The respiratory class of diseases also give 10 cases, of which 2 were asthma, 5 bronchitis, and 1 pleuritis. The loss of service was 133 days, and the daily average number sick was $1.57\frac{0}{0}$.

Under the head of diseases of the digestive system 24 cases were returned, the ratio of which was $105.26\frac{0}{0}$, nearly the same as that of last year, which was $103.44\frac{0}{0}$. The loss of service was 137 days, and the daily average number sick $1.62\frac{0}{0}$. One case of chronic diarrhœa was invalided.

Diseases of the genito-urinary system contributed 14 cases, and the ratio was $61.40\frac{0}{0}$, a slight increase over $56.03\frac{0}{0}$ given last year. The cases were mostly of orchitis, 8 cases being returned. There were no cases of chancroids, and but 2 of gonorrhœa, and there were 3 of prostatitis. The loss of service was 161 days, the average duration of treatment being 11.5 days.

Integumentary diseases aggregated 16 cases, giving the comparatively small ratio of $70.17\frac{0}{0}$, while last year it was $112.06\frac{0}{0}$. The cases were nearly all of abscesses and furunculus. The loss of service was 134 days, and the number sick daily from these affections was in the ratio of $1.57\frac{0}{0}$.

The ratio contributed by 26 cases of injuries was $114.03\frac{0}{0}$, while that of last year was $124.99\frac{0}{0}$. The chief factor was vulnus laceratum, of which there were 8 cases, and 1 of them was fatal. There was also a death from contusion. The number of sick days was 398, the daily average of sick $4.78\frac{0}{0}$, and the average duration of treatment 15.30 days.

U. S. S. *Galena*

G. S. Beardsley

*, Surgeon.

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January	Observations untrustworthy										231	25	22.6	2	+	Sierra Leone 344 Monrovia & Cape Palmas 6-9 Pinto Praya 17 & 19 Teneriffe 24 to 26 Funchal from 29
February	do.										231	19.1	16.2	2		Funchal 1 Tangiers 5 & 6 Gibraltar 7 Villefranche from 12
March	do.										231	20.7	15.3	5		Villefranche to 13 Palermo 16 to 30
April	do.										220	20.4	16	0		Malta 1 to 5 Loeghorn 8 to 27 Villefranche from 28
May	do.										219	22.3	18.4	2		Villefranche to 4, Port Mahon 6-15 Gibraltar & Tangiers 16 to 20 Casa Blanca 23 Mazagan & Mogador 24 & 25 Gibraltar 28 to 30
June	do.										219	25.3	24	1		Malta 5 Alexandria from 10
July	do.										226	25.8	24.5	0		Alexandria to 11 Malta 18 & 19 Gibraltar from 25
August	do.										225	26.9	25.2	0		Funchal 5 & 6
September	do.										225	23.3	20.5	4		Rio de Janeiro 12 to 16 Montevideo 28 to 30
October	do.										237	20.4	17.9	2		Montevideo
November	do.										237	21.7	19.3	1		do.
December	do.										236	23	20.5	4		do.

* G. B. Lippincott P. A. Surgeon, 2^d quarter. + Berth deck shellacked. ? Steam heat.

LANCASTER.

This vessel continued to be the flag-ship of the squadron, and spent the entire year in the Mediterranean, much of the time at and near Alexandria, Egypt. During the year she remained in port 81 days, and was at sea 284 days. Upon examination of the returns from this ship, it will be seen that the ratios of sickness in the various classes of disease have been very low, especially as compared with the other ships of the station. This is especially the case in those classes where the sick rate is more or less affected by the sanitary and hygienic influences of the ship, the zymotic, nervous, respiratory, digestive, and integumentary classes, which will be seen to be very considerably smaller than those of the other vessels. The beneficial results of the system of ventilation which has been in use on the Lancaster are thus exhibited in the most practical way, and afford a gratifying confirmation of the views which were expressed by the Bureau in its reports for 1879 and 1880, with regard to the adoption of this plan in the various ships of the Navy.

In the zymotic class of diseases the ratio afforded by 15 cases was $35.96\frac{0}{0}$, which is even smaller than that of last year, $55.52\frac{0}{0}$. The chief factors of the aggregate were, intermittent fever, 10; vaccina, 2; varioloides, 2. The loss of service was 171 days, and the average number sick days, $1.10\frac{0}{0}$. One case of febris remittens was invalided.

The constitutional class was represented by 43 cases, and a ratio of $103.11\frac{0}{0}$, as against $62.42\frac{0}{0}$ last year. The cases were chiefly made up of adynamia, 6 cases; lumbago, 4; rheumatism, 8, and syphilis, 25. The loss of service was 1,442 days, the daily sick rate $9.71\frac{0}{0}$, and the average duration of treatment 33.53 days. Seven cases, a ratio of $16.78\frac{0}{0}$, were invalided.

Of diseases falling under the head of nervous affections but 8 cases were noticed, giving the very small ratio of $19.18\frac{0}{0}$, as against $27.79\frac{0}{0}$ last year. It is observed that she was exempt from cephalalgia, usually one of the principal factors making up this class. There were 2 cases of paralysis which were invalided to hospital, and 1 each of mania and melancholia, which were long under treatment before being invalided. The loss of service was 283 days, and the average number sick daily was equal to $1.84\frac{0}{0}$.

The ratio contributed by 17 cases of diseases of the respiratory organs was $40.76\frac{0}{0}$, as against $41.64\frac{0}{0}$ in the preceding year. The loss of service was 538 days, and the average number sick daily $3.52\frac{0}{0}$. Two cases of chronic bronchitis, 1 of phthisis, and 1 of pneumonia, were invalided to hospital, the ratio being $9.59\frac{0}{0}$.

The cases of disease of the digestive system numbered 12, which gives a ratio of $28.77\frac{0}{0}$, which is less than one-fourth that of any other ship on the station, and about the same as that of last year reported from this vessel. Forty days of service only were lost, and the ratio of sick daily was $.2\frac{0}{0}$. Two cases, or $4.79\frac{0}{0}$, were invalided to hospital.

Diseases of the genito-urinary system contributed 39 cases, and the ratio was $93.82\frac{0}{0}$, a considerable increase over that of last year, $41.64\frac{0}{0}$. The number of sick days was 635, and the number of sick daily was in the ratio of $4.14\frac{0}{0}$. One case of cystitis was invalided to hospital, and there was one death from albuminuria. The average duration of treatment was 16.28 days.

The integumentary diseases on this ship were made up of 8 cases of furunculus, and 5 of ulcus, 13 cases giving a ratio of $31.16\frac{0}{0}$, by far the

lowest of the squadron. The loss of service was 137 days, and the ratio of daily sick $.88\frac{0}{0}$.

Resulting from violence there were 49 cases, a ratio of $117.50\frac{0}{0}$, with an attendant loss of service of 446 days. The daily ratio of sick was $2.94\frac{0}{0}$, and the average duration of treatment 9.10 days. There were single deaths from contusion and contused wound, a ratio of $4.79\frac{0}{0}$, and 1 case of fracture was invalided to hospital.

NIPSIC.

This vessel was actively engaged during the year in cruising in the Mediterranean, spending a considerable portion of the year in the various ports of the East, especially Smyrna and Alexandria. She was at sea 88 days and in port 277 days.

In the zymotic class of diseases were included 18 cases, mostly of simple continued fever, and the ratio was $101.68\frac{0}{0}$, a large increase over that of last year, which was $32.79\frac{0}{0}$. The loss of service was 220 days, and the ratio of daily sick $3.50\frac{0}{0}$. There was no invaliding, and the average duration of treatment was 12.61 days.

The constitutional diseases contributed 52 cases, and the large ratio of $293.78\frac{0}{0}$, as against $382.58\frac{0}{0}$ last year. There was a loss of service of 776 days, an average ratio of sick of $11.97\frac{0}{0}$, and an average duration of treatment of 16.92 days.

Of diseases of the nervous system there were 25 cases, and the ratio of admissions was $141.24\frac{0}{0}$, as against $158.45\frac{0}{0}$ last year. The daily ratio of sick was $4.68\frac{0}{0}$, and the total loss of time 304 days, or 12.16 days for each case. One case of dementia was invalided.

There were returned 38 cases of disease of the respiratory organs, or $214.68\frac{0}{0}$, a considerable falling off from the large rate of last year, $415.56\frac{0}{0}$. The daily ratio of sick was $8.63\frac{0}{0}$, and the loss of service 560 days, averaging 14.73 for each case. One case of phthisis and 1 of pneumonia were invalided, the ratio being $11.29\frac{0}{0}$.

Fifty-two cases fell within the class of diseases of the digestive system, giving a ratio of $293.78\frac{0}{0}$, as against $538.76\frac{0}{0}$ last year. The number of sick days was 353, and the ratio of sick daily was $5.42\frac{0}{0}$. All the cases recovered after an average duration of treatment of 6.78 days.

The cases in the class of genito-urinary diseases numbered 13, with the ratio of $73.44\frac{0}{0}$, and an average daily ratio of sick of $2.65\frac{0}{0}$. The admission rate was somewhat larger than that of last year, which was $60.20\frac{0}{0}$. The loss of service was 174 days, averaging 13.38 for each case.

Integumentary diseases yielded the large aggregate of 51 cases, of which 31 were furunculus and 9 abscessus. The case ratio was $288.14\frac{0}{0}$ as against $147.52\frac{0}{0}$ last year. The loss of time was 301 days, and the daily average ratio of sickness $4.63\frac{0}{0}$. There was no invaliding.

The cases resulting from injuries amounted to 28, and the ratio was $158.19\frac{0}{0}$, while the daily sickness was in the ratio of $158.19\frac{0}{0}$. The loss of service was 286 days, and the average duration of treatment 10.21 days. One case of fracture was invalided to hospital.

QUINNEBAUG.

This vessel, like the other ships of the squadron, spent the entire year in the Mediterranean Sea, and was actively employed in cruising between its various ports, especially in the vicinity of Egypt during the hostilities there.

Zymotic diseases contributed 17 cases, to the returns of this ship, a ratio of $81.33\frac{0}{0}$, 13 cases being of intermittent fever and one of typhoid, the latter proving fatal. The loss of service was 146 days and the daily ratio of sick $1.91\frac{0}{0}$. The average duration of treatment was 8.58 days. There was no invaliding.

The constitutional group furnished 33 cases, and a ratio of $157.89\frac{0}{0}$ as against $171.79\frac{0}{0}$ last year. The daily ratio of sickness was $7.27\frac{0}{0}$ and the total loss of service was 557 days. Three cases were invalided.

The group of nervous diseases contributed 23 cases, a ratio of $110.04\frac{0}{0}$ as against $74.88\frac{0}{0}$ last year. The daily sick rate was $2.20\frac{0}{0}$ and the loss of service was 169 days. Single cases of mania and pleurodynia were invalided, making the ratio of $9.56\frac{0}{0}$.

There were 68 cases of diseases of the respiratory organs, yielding the very large ratio of $325.35\frac{0}{0}$, as against $224.67\frac{0}{0}$ last year. The cases were chiefly bronchial and catarrhal, 4 of which were invalided, and there was one death from pneumonia. The loss of service was 1,017 days, or 14.95 for each case, and the average daily sick rate was $13.30\frac{0}{0}$.

Sixty cases made up the total of the digestive class, giving a ratio of $287.08\frac{0}{0}$, while in 1881 it was $308.35\frac{0}{0}$. The total number of sick days was 853, and the daily average ratio of sick was $11.14\frac{0}{0}$. Two cases of dyspepsia and 2 of hernia were invalided to hospital ($19.13\frac{0}{0}$), and 1 case of hernia was discharged from the service.

Twenty cases fell under the head of genito-urinary affections, and the ratio was $95.69\frac{0}{0}$, an increase over that of last year, which was $52.91\frac{0}{0}$. The loss of service was 449 days and the daily average ratio of sick $5.88\frac{0}{0}$.

There were 24 cases of integumentary diseases, giving a ratio of $114.35\frac{0}{0}$, with a loss of service of 232 days. One case of abscessus was invalided and the average duration of treatment was 9.66 days, while the average number of sick daily was $3.01\frac{0}{0}$.

Violent diseases and deaths gave 52 admissions, the ratio being $248.80\frac{0}{0}$, as against $209.03\frac{0}{0}$ last year. There was a loss of service of 620 days; the average duration of treatment was 11.92 days, and the daily average ratio of sick $8.08\frac{0}{0}$. One case of *concussio cerebri* was invalided, and there was a death from fracture, the ratio in each case being $4.78\frac{0}{0}$.

TABLE I.—*Showing the force on each ship, the number admitted and discharged, number*

Vessels.	Strength.	Strength corrected for time.	Admitted.					Total.
			From last year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	
Galena, third rate, 910 tons, wood, screw; service, 365 days	228	228	3	28	47	47	36	161
Lancaster, second rate, 2,120 tons, wood, screw; service, 365 days	417	417	6	60	58	30	47	201
Nipsic, third rate, 695 tons, wood, screw; service, 365 days	177	177	6	65	62	93	64	290
Quinnebaug, third rate, 910 tons, wood, screw; service, 365 days	209	209	6	98	65	96	61	326
Total	1,031	1,031	21	251	232	266	208	978

of days under treatment, and average per thousand of force on the European station.

Discharged.					Continued.	Number of sick days.	Average number of days under treatment.	Daily average number of sick.		Number admitted per 1,000 of force.
Cured.	Invalided.		Died.	Total.				Absolute.	Per 1,000 of force.	
	To hospital.	From the service.								
153	3	.....	3	159	2	1,857	11.53	5.08	22.28	706.14
168	23	.....	3	194	7	3,734	18.57	10.23	24.53	482.01
265	5	.....	.....	270	20	3,244	11.18	8.88	50.16	1,638.41
300	16	2	3	321	5	4,277	13.11	11.71	56.02	1,559.80
886	47	2	9	944	34	13,112	13.40	35.92	34.83	948.59

TABLE II.—Showing the number of cases, the discharged, invalided and dead, for

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Erysipelas	1	.96	31
Febris continua simplex	30	29.09	196
Febris enterica	4	3.87	122
Febris intermittens	35	33.94	196
Febris remittens	8	7.75	138
Vaccina	4	3.87	63
Variola	2	1.93	75
Total	84	81.47	821
II.—CONSTITUTIONAL DISEASES.			
Adynamia	20	19.39	533
Hydrops	2	1.93	16
Lumbago	15	14.54	85
Podagra	1	.96	1
Rheumatismus acutus	16	15.51	237
Rheumatismus chronicus	41	39.76	602
Syphilis primitiva	27	26.18	994
Syphilis consecutiva	19	18.33	630
Total	141	136.76	3,098
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Cephalagia	18	17.45	32
Dementia	2	1.93	85
Mania	2	1.93	170
Melancholia	1	.96	115
Nausea marina	3	2.90	11
Neuralgia	31	30.06	340
Paralysis	2	1.93	3
Pleurodynia	6	5.81	27
Vertigo	1	.96	6
Total	66	64.01	789
II.—DISEASES OF THE EYE.			
Conjunctivitis	2	1.93	23
Iritis	2	1.93	28
Total	4	3.87	51
IV.—DISEASES OF THE TEETH.			
Odontalgia	1	.96	2
Total	1	.96	2
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Palpitatio	9	8.72	176
Total	9	8.72	176
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Asthma	3	2.90	15
Bronchitis acuta	25	24.24	388
Bronchitis chronica	15	14.54	452
Catarrhus	77	74.68	864
Phthisis pneumonica acuta	1	.96	48
Phthisis pneumonica chronica	2	1.93	205
Pleuritis	4	3.87	125
Pneumonia	6	5.81	151
Total	133	129	2,248

each disease, and their ratio per thousand of force, on the European Station.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.08	.07	31.	1	.96							
.53	.51	.53	30	29.09							
.36	.34	30.5	1	.96	1	.96			2	1.92	
.53	.51	5.6	34	32.98							1
.37	.35	17.25	7	6.78	1	.96					
.17	.16	15.75	4	3.87							
.20	.19	37.5	2	1.93							
2.24	2.17	9.77	79	76.62	2	1.93			2	1.92	1
1.46	1.41	26.65	15	14.54	4	3.87					1
.04	.03	8	2	1.93							
.23	.22	6.66	13	12.60							2
		1	1	.96							
.64	.63	14.81	15	14.54			1	.86			
1.64	1.59	14.68	36	34.91	2	1.93					3
2.72	2.63	36.81	27	26.18							
1.72	1.66	33.15	13	12.60	3	2.90					3
8.48	8.22	21.97	122	118.33	9	8.72	1	.96			9
.08	.07	1.77	18	17.45							
.23	.22	42.5	1	.96	1	.96					
.46	.44	85			2	1.93					
.34	.32	115			1	.96					
.03	.02	3.66	3	2.90							2
.93	.90	10.96	29	28.12							
		1.5			2	1.93					
.07	.06	4.5	5	4.84	1	.96					
.01		6	1	.96							
2.16	2.09	11.95	57	55.28	7	6.78					2
.06	.05	11.5	2	1.93							
.07	.06	14	2	1.93							
.13	.12	12.75	4	3.87							
		2	1	.96							
		2	1	.96							
.48	.46	19.55	3	2.90	4	3.87					2
.48	.46	19.55	3	2.90	4	3.87					2
.04	.03	5	3	2.90							
1.06	1.02	15.52	24	23.27							1
1.23	1.19	30.13	6	5.81	6	5.81					3
2.36	2.28	11.22	72	69.83	1	.96					4
.13	.12	48			1	.96					
.56	.54	102.5	1	.96	1	.96					
.34	.32	31.25	4	3.87							
.41	.39	25.16	3	2.90	2	1.93			1	.96	
6.15	5.96	16.90	113	109.60	11	10.66			1	.96	8

TABLE II.—*Showing the number of cases, the discharged, invalided, and dead,*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES.—Continued.			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Cholera morbus.....	5	4.84	15
Colica.....	25	24.24	64
Constipatio.....	4	3.87	12
Diarrhœa acuta.....	54	52.37	250
Diarrhœa chronica.....	4	3.87	81
Dyspepsia.....	9	8.72	374
Fistula in ano.....	1	.96	11
Gastritis.....	1	.96	1
Hæmorrhoids.....	8	7.75	99
Hernia.....	7	6.78	268
Icterus.....	3	2.90	47
Tonsillitis.....	27	26.18	161
Total.....	148	143.54	1,383
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Albuminuria.....	2	1.93	50
Balanitis.....	2	1.93	8
Calculus.....	2	1.93	4
Chaneroides.....	19	18.42	414
Cystitis.....	3	2.90	140
Gonorrhœa.....	24	23.27	416
Orchitis.....	25	24.24	280
Paraphymosis.....	2	1.93	21
Prostatitis.....	4	3.87	51
Spermatorrhœa.....	1	.96	9
Varicocele.....	2	1.93	26
Total.....	86	83.11	1,419
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Arthritis.....	2	1.93	89
Ankylosis.....	2	1.93	16
Periostitis.....	1	.96	4
Total.....	5	4.84	109
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus.....	29	28.12	239
Eczema.....	5	4.84	32
Furunculus.....	54	52.37	349
Paronychia.....	5	4.84	24
Ulcus.....	11	10.66	160
Total.....	104	100.87	804
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis.....	20	19.39	316
Total.....	20	19.39	316
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Condyloma.....	1	.96	13
Cystis.....	2	1.93	56
Total.....	3	2.90	69
C.—POISONS.			
Alcoholismus.....	19	18.42	77
Total.....	19	18.42	77

TABLE II.—*Showing the number of cases, the discharged, invalided and dead,*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio	5	4.84	48
Ambustio	6	5.81	73
Concussio cerebri	4	3.87	18
Contusio	57	55.28	366
Fractura	7	6.78	184
Stremma	28	27.15	390
Submersio	1	.96	1
Vulnus contusum	16	15.51	143
Vulnus incisum	9	8.72	118
Vulnus laceratum	14	13.57	357
Vulnus punctum	7	6.78	36
Vulnus sclopetarium	1	.96	16
Total	155	150.33	1,750
Grand total	978	948.59	13,112

for each disease, and their ratio per thousand of force, &c.—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.13	.12	9.6	5	4.84	.....	.....	.....	.....	.....	.....	.....
.20	.19	12.16	6	5.81	.....	.....	.....	.....	.....	.....	.....
.04	.03	4.5	2	1.93	1	.96	.....	.....	1	.96	.....
1.	.96	6.42	55	53.34	.....	.....	.....	.....	1	.96	1
.50	.48	26.28	4	3.87	2	1.93	.....	.....	1	.96	.....
1.06	1.02	13.92	26	25.21	.....	.....	.....	.....	.....	.....	2
.....	.....	1.	.....	.....	.....	.....	.....	.....	1	.96	.....
.39	.38	8.93	16	15.51	.....	.....	.....	.....	.....	.....	.....
.32	.31	13.11	8	7.75	.....	.....	.....	.....	.....	.....	1
.97	.94	25.5	13	12.60	.....	.....	.....	.....	1	.96	.....
.09	.08	5.14	7	6.78	.....	.....	.....	.....	.....	.....	.....
.04	.03	16.	1	.96	.....	.....	.....	.....	.....	.....	.....
4.79	4.64	11.29	143	138.70	3	2.90	.....	.....	5	4.84	4
35.92	34.83	13.40	886	859.35	47	45.58	2	1.93	9	8.72	34

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Galena.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
A.—GENERAL DISEASES.				
I.—ZYMOTIC DISEASES.				
Erysipelas	17			
Febris continua simplex.....	3	1		1
Febris enterica.....	6			
Febris intermittens	6			
Febris remittens	2			
Vaccina				
Variola.....				
Total.....	34	1		1
Ratio per thousand	149. 12	4. 38		4. 38
Number of sick days	275			
Average number sick daily.....	. 75			
Average number sick daily per thousand.....	3. 28			
Average duration of treatment.....	8. 08			
II.—CONSTITUTIONAL DISEASES.				
Adynamia	1			
Hydrops				
Lumbago.....	1			
Podagra.....				
Rheumatismus acutus.....	7			
Rheumatismus chronicus.....	1			
Syphilis primitiva.....	1			
Syphilis consecutiva	2			
Total.....	13			
Ratio per thousand.....	57. 01			
Number of sick days	323			
Average number sick daily.....	. 88			
Average number sick daily per thousand	3. 85			
Average duration of treatment.....	24. 84			
B.—LOCAL DISEASES.				
I.—DISEASES OF THE NERVOUS SYSTEM.				
Cephalalgia	3			
Dementia				
Mania				
Melancholia.....				
Nausea marina				
Neuralgia	6			
Paralysis.....				
Pleurodynia.....	1			
Vertigo				
Total.....	10			
Ratio per thousand.....	43. 85			
Number of sick days	33			
Average number sick daily.....	. 09			
Average number sick daily per thousand	. 39			
Average duration of treatment.....	3. 3			

TABLE III.—Showing the number of cases, the invalided and dead,

Vessels or stations	Galena.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
II.—DISEASES OF THE EYE.				
Conjunctivitis	1			
Iritis				
Total	1			
Ratio per thousand.....	4.38			
Number of sick days.....	20			
Average number sick daily.....	.05			
Average number sick daily per thousand	.21			
Average duration of treatment.....	20			
IV.—DISEASES OF THE TEETH.				
Odontalgia				
Ratio per thousand.....				
Number of sick days				
Average number of sick daily				
Average number sick daily per thousand				
Average duration of treatment.....				
VI.—DISEASES OF THE CIRCULATORY SYSTEM.				
Palpitatio				
Ratio per thousand.....				
Number of sick days.....				
Average number sick daily				
Average number sick daily per thousand.....				
Average duration of treatment.....				
VI.—DISEASES OF THE RESPIRATORY SYSTEM.				
Asthma	2			
Bronchitis acuta	5			
Bronchitis chronica	2	1		
Catarrhus.....				
Phthisis pneumonica acuta.....				
Phthisis pneumonica chronica.....				
Pleuritis	1			
Pneumonia.....				
Total.....	10	1		
Ratio per thousand.....	43.85	4.38		
Number of sick days.....	133			
Average number of sick daily.....	.36			
Average number sick daily per thousand	1.57			
Average duration of treatment.....	13.30			

for each disease, on each vessel on the European Station—Continued.

Lancaster.				Nipsic.				Quinnebaug.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
2								1			
2								1			
4.79								4.78			
28								3			
.07											
.16											
14								3			
				1							
				5.64							
				2							
				.2							
1	1			4	1			4	2		
2.39	2.39			22.59	5.64			19.13	9.56		
1				119				56			
				.32				.15			
				1.80				.71			
				29.75				14			
4				1				14	3		
4	2			2				5	1		
2				28				47			
				1	1						
2	1										
3											
2	1			2	1			2			1
17	4			38	2			68	4		1
40.76	9.59			214.68	11.29			325.35	19.13		4.78
538				560				1017			
1.47				1.53				2.78			
3.52				8.63				13.30			
31.64				14.73				14.95			

TABLE III.—*Showing the number of cases, the invalided and dead, for*

Vessels or stations	Galena.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
LOCAL DISEASES—Continued.				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.				
Cholera morbus				
Colica	8			
Constipatio				
Diarrhœa acuta	5			
Diarrhœa chronica	1	1		
Dyspepsia				
Fistula in ano				
Gastritis				
Hæmorrhoids	3			
Hernia				
Icterus	1			
Tonsillitis	6			
Total	24	1		
Ratio per thousand	105.26	4.38		
Number of sick days	137			
Average number sick daily	.37			
Average number sick daily per thousand	1.62			
Average duration of treatment	5.70			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.				
Albuminuria				
Balanitis				
Calculus				
Chancroides				
Cystitis				
Gonorrhœa	2			
Orchitis	8			
Paraphymosis	1			
Prostatitis	3			
Spermatorrhœa				
Varicocele				
Total	14			
Ratio per thousand	61.40			
Number of sick days	161			
Average number sick daily	.44			
Average number sick daily per thousand	1.92			
Average duration of treatment	11.5			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.				
Arthritis	2			
Ankylosis				
Periostitis	1			
Total	3			
Ratio per thousand	13.15			
Number of sick days	93			
Average number sick daily	.25			
Average number sick daily per thousand	1.09			
Average duration of treatment	31.			

TABLE III.—Showing the number of cases, the invalided and dead, for

Vessels or stations.....	Galena.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.				
Abscessus	5			
Eczema	1			
Furunculus	8			
Paronychia.....				
Ulcer	2			
Total	16			
Ratio per thousand.....	70.17			
Number of sick days.....	134			
Average number sick daily.....	.36			
Average number sick daily per thousand.....	1.57			
Average duration of treatment.....	8.37			
XI.—DISEASES OF THE ABSORBENT SYSTEM.				
Adenitis	10			
Ratio per thousand.....	43.85			
Number of sick days.....	150			
Average number sick daily	.41			
Average number sick daily per thousand.....	1.79			
Average duration of treatment.....	15			
XII.—NON-MALIGNANT TUMORS AND CYSTS.				
Condyloma.....				
Cystis.....				
Total.....				
Ratio per thousand.....				
Number of sick days.....				
Average number sick daily.....				
Average number sick daily per thousand				
Average duration of treatment.....				
C.—POISONS.				
Alcoholismus				
Ratio per thousand.....				
Number of sick days				
Average number sick daily				
Average number sick daily per thousand.....				
Average duration of treatment				

TABLE III.—*Showing the number of cases, the invalided and dead, for*

Vessels or stations	Galena.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS.				
Abrasio	1			
Ambustio	1			
Concussio cerebri				1
Contusio	7			
Fractura	1			
Stremma	8			
Submersio				
Vulnus contusum				
Vulnus incisum				
Vulnus laceratum	8			1
Vulnus punctum				
Vulnus sclopetarium				
Total	26			2
Ratio per thousand	114. 03			8. 77
Number of sick days	398			
Average number sick daily	1. 09			
Average number sick daily per thousand	4. 78			
Average duration of treatment	15. 30	3		
Grand total	161	13. 15		3
Ratio per thousand	706. 14			13. 15
Number of sick days	1, 857			
Average number sick daily	5. 08			
Average number sick daily per thousand	22. 28			
Average duration of treatment	11. 53			

each disease, on each vessel on the European Station—Continued.

Lancaster.				Nipsic.				Quinnebaug.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....
1	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....
1	.....	.....	1	.....	.....	.....	.....	3	1	.....	.....
21	.....	.....	.....	11	.....	.....	.....	18	.....	.....	.....
3	1	.....	.....	1	1	.....	.....	2	.....	.....	1
1	.....	.....	.....	5	.....	.....	.....	14	.....	.....	.....
1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
9	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....
2	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....
2	.....	.....	.....	1	.....	.....	.....	4	.....	.....	.....
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
49	1	.....	2	28	1	.....	.....	52	1	.....	1
117.50	2.39	.....	4.79	158.19	5.64	.....	.....	248.80	4.78	.....	4.78
446	.....	.....	.....	286	.....	.....	.....	620	.....	.....	.....
1.22	..	.....	.....	.78	.....	.....	.....	1.69	.....	.....	.....
2.94	.....	.....	.....	4.40	.....	.....	.....	8.08	.....	.....	.....
9.10	.....	.....	.....	10.21	.....	.....	.....	11.92	.....	.....	.....
201	23	.....	3	290	5	.....	.....	326	16	2	3
482.01	55.15	.....	7.19	1,638.41	28.24	.....	.....	1,559.80	76.55	9.56	14.35
3,734	.....	.....	.....	3,244	.....	.....	.....	4,277	.....	.....	.....
10.23	.....	.....	.....	8.88	.....	.....	.....	11.71	.....	.....	.....
24.53	.....	.....	.....	50.16	.....	.....	.....	56.02	.....	.....	.....
18.57	.....	.....	.....	11.18	.....	.....	.....	13.11	.....	.....	.....

TABLE IV.—*European Station.*—Showing the number of cases, the inva-

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 501.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febris continua simplex	13	25.94						
Febris enterica	2	3.99	1	1.99			1	1.99
Febris intermittens	9	17.96						
Febris remittens	4	7.98						
Vaccina	4	7.98						
Variola	1	1.99						
Total	33	65.86	1	1.99			1	1.99
II.—CONSTITUTIONAL DISEASES.								
Adynamia	8	15.96	2	3.99				
Hydrops								
Lumbago	5	9.98						
Podagra								
Rheumatismus acutus	5	9.98						
Rheumatismus chronicus	9	17.69	1	1.99				
Syphilis primitiva	17	33.93						
Syphilis consecutiva	8	15.96						
Total	52	103.79	3	5.98				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	5	9.98						
Dementia								
Mania	2	3.99	2	3.99				
Melancholia	1	1.99	1	1.99				
Nausea marina	1	1.99						
Neuralgia	11	21.95						
Paralysis								
Pleurodynia	2	3.99	1	1.99				
Vertigo								
Total	22	43.91	4	7.98				
II.—DISEASES OF THE EYE.								
Conjunctivitis	1	1.99						
Iritis								
Total	1	1.99						
IV.—DISEASES OF THE TEETH.								
Odontalgia								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Palpitatio	8	15.96	3	5.98				
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma								
Bronchitis acuta	13	25.94						

lided, and the dead, in decennial periods, with the ratios per thousand.

BETWEEN 25 AND 35 YEARS. (Mean force, 357.)								BETWEEN 35 AND 45 YEARS. (Mean force, 131.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
12	33.61							1	7.63						
2	5.60					1	2.80	5	38.16						
18	50.42							5	38.16						
2	5.60							1	7.63						
1	2.80														
35	98.03					1	2.80	12	91.60						
6	16.80							4	30.53						
2	5.60							1	7.63						
7	19.60							1	7.63						
9	25.21			1	2.80			1	7.63						
12	33.61	1	2.80					12	91.60						
7	19.60							3	22.90						
8	22.40	3	8.40					3	22.90						
51	144.53	4	11.20	1	2.80			25	190.83						
7	19.60							4	30.53						
2	5.60	1	2.80												
1	2.80							1	7.63						
14	39.21							2	15.26						
1	2.80	1	2.80					1	7.63	1	7.63				
4	11.20														
1	2.80														
30	84.03	2	5.60					8	61.06	1	7.63				
2	5.60														
2	5.60														
1	2.80														
1	2.80	1	2.80												
6	16.80							3	22.90						
								3	22.90						

TABLE IV.—*European Station.*—Showing the number of cases, the invalided,

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 501.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYS- TEM—Continued.								
Bronchitis chronica.....	8	15.96	3	5.98				
Catarrhus	28	55.88						
Phthisis pneumonica acuta								
Phthisis pneumonica chronica.....	1	1.99	1	1.99				
Pleuritis	2	3.99						
Pneumonia	4	7.98	1	1.99			1	1.99
Total	56	111.77	5	9.98			1	1.99
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	1	1.99						
Colica	13	25.94						
Constipatio.....	2	3.99						
Diarrhœa acuta	22	43.91						
Diarrhœa chronica								
Dyspepsia.....	4	7.98	2	3.99				
Fistula in ano								
Gastritis								
Hæmorrhoids	1	1.99						
Hernia	1	1.99						
Icterus								
Tonsillitis.....	21	41.92						
Total	65	129.74	2	3.99				
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria								
Balanitis	2	3.99						
Calculus								
Chancroides.....	12	23.94						
Cystitis	1	1.99	1	1.99				
Gonorrhœa.....	13	25.94						
Orchitis	16	31.93						
Paraphymosis.....	1	1.99						
Prostatitis								
Spermatorrhœa								
Varicocele								
Total.....	45	89.82	1	1.99				
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis.....								
Ankylosis.....								
Periostitis								
Total.....								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus	16	31.93	1	1.99				
Eczema								
Furunculus	29	57.87						
Paronychia.....	5	9.98						
Ulcus	8	15.96	1	1.99				
Total.....	58	115.76	2	3.99				
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	14	27.94						

and the dead, in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 357)								BETWEEN 35 AND 45 YEARS. (Mean force, 131.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
5	14	1	2.80	.....	.....	.....	.....	2	15.26	2	15.26	.....	.....	.....	.....
24	67.22	.....	.....	.....	.....	.....	.....	18	137.40	1	7.63	.....	.....	.....	.....
1	2.80	1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	2	15.26	1	7.63	.....	.....	.....	.....
.....															
38	106.44	2	5.60	.....	.....	.....	.....	29	221.37	4	30.53	.....	.....	.....	.....
.....															
3	8.40	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
4	11.20	.....	.....	.....	.....	.....	.....	8	22.40	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
16	44.81	.....	.....	.....	.....	.....	.....	10	76.33	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	3	22.90	1	7.63	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	4	30.53	1	7.63	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	7.63	1	7.63	.....	.....	.....	.....
5	14	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
6	16.80	2	5.60	1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	8.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	16.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
46	128.85	2	5.60	1	2.80	.....	.....	31	236.64	3	22.90	.....	.....	.....	.....
.....															
1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
6	16.80	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
2	5.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	30.81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	25.21	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
.....															
4	11.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	5.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
37	103.64	.....	.....	.....	.....	.....	.....	3	22.90	.....	.....	.....	.....	.....	.....
.....															
2	5.60	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	8.40	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
.....															
10	28.01	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
4	11.20	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
23	64.42	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
1	2.80	1	2.80	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
38	106.44	1	2.80	.....	.....	.....	.....	6	45.80	.....	.....	.....	.....	.....	.....
.....															
5	14	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....

TABLE VI.—*European Station.*—Showing the number of cases, the invalided

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 501.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Condyloma	1	1.99	.....	.....	.....	.....	.....	.....
Cystis	2	3.99	.....	.....	.....	.....	.....	.....
Total	3	5.98	.....	.....	.....	.....	.....	.....
C.—POISONS.								
Alcoholismus	1	1.99	.....	.....	.....	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	2	3.99	.....	.....	.....	.....	.....	.....
Ambustio	4	7.98	.....	.....	.....	.....	.....	.....
Concussio cerebri	2	3.99	.....	.....	.....	1	1.99	.....
Contusio	20	39.92	.....	.....	.....	.....	.....	.....
Fractura	3	5.98	.....	.....	.....	1	1.99	.....
Stremma	14	27.94	.....	.....	.....	.....	.....	.....
Submersio .....	.....	.....	.....	.....	.....	.....	.....	.....
Vulnus contusum	6	11.97	.....	.....	.....	.....	.....	.....
Vulnus incisum	6	11.97	.....	.....	.....	.....	.....	.....
Vulnus laceratum	7	13.97	.....	.....	.....	.....	.....	.....
Vulnus punctum	2	3.99	.....	.....	.....	.....	.....	.....
Vulnus sclopetarium	1	1.99	.....	.....	.....	.....	.....	.....
Total	67	133.73	.....	.....	.....	2	3.99	.....
Grand aggregate	425	848.30	21	41.92	.....	4	7.98	.....

and the dead, in decennial periods, with the ratios per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 357.)								BETWEEN 35 AND 45 YEARS. (Mean force, 131.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
10	28.01	.....	.....	.....	.....	.....	.....	6	45.80	.....	.....	.....	.....	.....	.....
2	5.60	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	.....	.....	1	7.63	.....	.....	.....	.....	.....	.....
2	5.60	1	2.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	84.03	.....	.....	.....	.....	1	2.80	6	45.80	.....	.....	.....	.....	.....	.....
2	5.60	2	5.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	25.21	.....	.....	.....	.....	.....	.....	4	30.53	.....	.....	.....	.....	.....	.....
1	2.80	.....	.....	.....	.....	1	2.80	.....	.....	.....	.....	.....	.....	.....	.....
6	16.80	.....	.....	.....	.....	.....	.....	2	15.26	.....	.....	.....	.....	.....	.....
3	8.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	16.80	.....	.....	.....	.....	1	2.80	1	7.63	.....	.....	.....	.....	.....	.....
4	11.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
66	184.87	3	8.40	.....	.....	3	8.40	15	114.50	.....	.....	.....	.....	.....	.....
363	1,016.80	15	42.01	2	5.60	4	11.20	138	1,053.43	8	61.06	.....	.....	.....	.....

TABLE IV.—*European Station.*—Showing the number of cases, the invalided

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 37.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES—Continued.								
I.—ZYMOTIC DISEASES.								
Erysipelas								
Febris continua simplex								
Febris enterica								
Febris intermittens	3	81.08						
Febris remittens	1	27.02	1	27.02				
Vaccina								
Variola								
Total	4	108.10	1	27.02				
II.—CONSTITUTIONAL DISEASES.								
Adynamia	2	54.05	2	54.05				
Hydrops								
Lumbago	1	27.02						
Podagra								
Rheumatismus acutus								
Rheumatismus chronicus	5	135.13						
Syphilis primitiva								
Syphilis consecutiva								
Total	8	216.21	2	54.05				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	2	54.05						
Dementia								
Mania								
Melancholia								
Nausea marina								
Neuralgia	4	108.10						
Paralysis								
Pleurodynia								
Vertigo								
Total	6	162.16						
II.—DISEASES OF THE EYE.								
Conjunctivitis	1	27.02						
Iritis								
Total	1	27.02						
IV.—DISEASES OF THE TEETH.								
Odontalgia								
V.—DISEASES OF THE CIRCULATORY SYS- TEM.								
Palpitatio								
VI.—DISEASES OF THE RESPIRATORY SYS- TEM.								
Asthma								
Bronchitis acuta	3	81.08						

TABLE IV.—*European Station.*—Showing the number of cases, the invalided,

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 37.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.—Continued.								
Bronchitis chronica								
Catarrhus	7	189.18						
Phthisis pneumonica acuta.....								
Phthisis pneumonica chronica								
Pleuritis								
Pneumonia.....								
Total.....	10	270.27						
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica								
Constipatio.....								
Diarrhœa acuta	6	162.16						
Diarrhœa chronica								
Dyspepsia								
Fistula in ano								
Gastritis								
Hæmorrhoids								
Hernia.....								
Icterus.....								
Tonsillitis.....								
Total.....	6	162.12						
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria	1	27.02					1	27.02
Balanitis								
Calculus								
Chancroides								
Cystitis								
Gonorrhœa.....								
Orchitis								
Paraphymosis.....								
Prostatitis								
Spermatorrhœa								
Varicocele.....								
Total.....	1	27.02					1	27.02
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis								
Ankylosis.....								
Periostitis.....								
Total.....								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus	1	27.02						
Eczema								
Furunculus								
Paronychia								
Ulcus								
Total	1	27.02						
XI —DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis								

and the dead, in decennial periods, with the ratios per thousand.—Continued.

ABOVE 55 YEARS. (Mean force, 5.)								TOTALS. (Mean force, 1,031.							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
.....								15	14.54	6	5.81	.....	.....	.....	.....
.....								77	74.68	1	.96	.....	.....	.....	.....
.....								1	.96	1	.96	.....	.....	.....	.....
.....								2	1.93	1	.96	.....	.....	.....	.....
.....								4	3.87	.....	.....	.....	.....	.....	.....
.....								6	5.81	2	1.93	.....	.....	1	.96
.....								133	129	11	10.66	.....	.....	1	.96
.....															
.....								5	4.84	.....	.....	.....	.....	.....	.....
.....								25	24.24	.....	.....	.....	.....	.....	.....
.....								4	3.87	.....	.....	.....	.....	.....	.....
.....								54	52.37	.....	.....	.....	.....	.....	.....
.....								4	3.87	1	.96	.....	.....	.....	.....
.....								9	8.72	3	2.90	.....	.....	.....	.....
.....								1	.96	.....	.....	.....	.....	.....	.....
.....								1	.96	1	.96	.....	.....	.....	.....
.....								8	7.75	.....	.....	.....	.....	.....	.....
.....								7	6.78	2	1.93	1	.96	.....	.....
.....								3	2.90	.....	.....	.....	.....	.....	.....
.....								27	26.18	.....	.....	.....	.....	.....	.....
.....								148	143.54	7	6.78	1	.96	.....	.....
.....															
.....								2	1.93	.....	.....	.....	.....	1	.96
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								19	18.42	.....	.....	.....	.....	.....	.....
.....								3	2.90	1	.96	.....	.....	.....	.....
.....								24	23.27	.....	.....	.....	.....	.....	.....
.....								25	24.24	.....	.....	.....	.....	.....	.....
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								4	3.87	.....	.....	.....	.....	.....	.....
.....								1	.96	.....	.....	.....	.....	.....	.....
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								86	83.11	1	.96	.....	.....	1	.96
.....															
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								2	1.93	.....	.....	.....	.....	.....	.....
.....								1	.96	.....	.....	.....	.....	.....	.....
.....								5	4.84	.....	.....	.....	.....	.....	.....
.....															
.....								29	28.12	1	.96	.....	.....	.....	.....
1	200	.....	.....	.....	.....	.....	.....	5	4.84	.....	.....	.....	.....	.....	.....
.....								54	52.37	.....	.....	.....	.....	.....	.....
.....								5	4.84	.....	.....	.....	.....	.....	.....
.....								11	10.66	2	1.93	.....	.....	.....	.....
1	200	.....	.....	.....	.....	.....	.....	104	100.87	3	2.90	.....	.....	.....	.....
.....															
.....								20	19.39	.....	.....	.....	.....	.....	.....

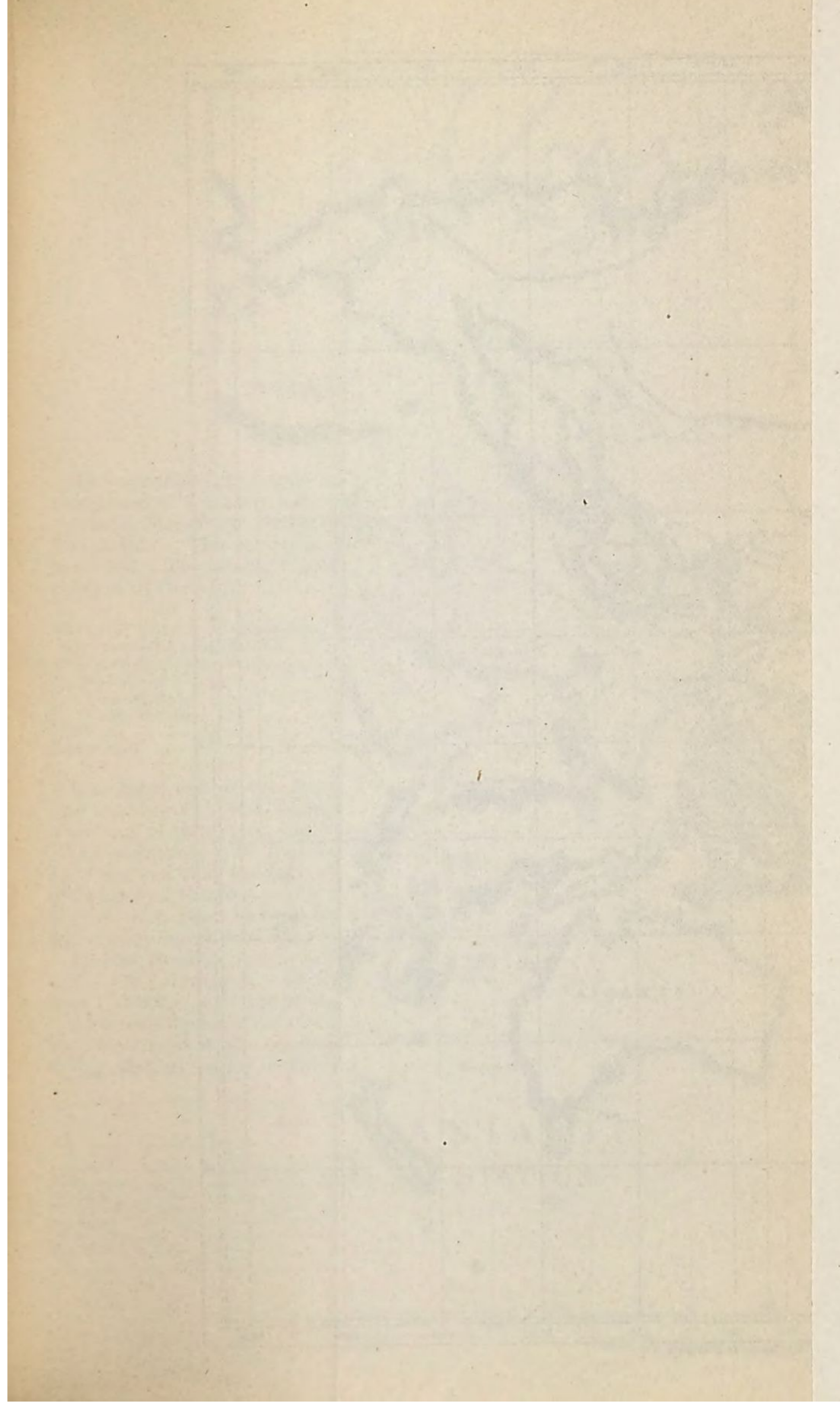
TABLE IV.—*European Station.*—Showing the number of cases, the invalided

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 37.)						
	Cases.		Invalided.				Died.
	Number.	Ratio $\frac{\text{‰}}{\text{‰}}$.	To hospital.		From service.		Number.
			No.	Ratio $\frac{\text{‰}}{\text{‰}}$.	No.	Ratio $\frac{\text{‰}}{\text{‰}}$.	
B.—LOCAL DISEASES—Continued.							
XII.—NON-MALIGNANT TUMORS AND CYSTS.							
Condyloma							
Cystis							
Total							
C.—POISONS.							
Alcoholismus	2	54. 05					
D.—VIOLENT DISEASES AND DEATHS.							
Abrasio							
Ambustio							
Concussio cerebri							
Contusio							
Fractura	1	27. 02					
Stremma							
Submersio							
Vulnus contusum	1	27. 02					
Vulnus incisum							
Vulnus laceratum							
Vulnus punctum							
Vulnus sclopetarium							
Total	2	54. 05					
Grand aggregate	41	1, 108. 10	3	81. 80			1 27. 02

and the dead, in decennial periods, with the ratios per thousand—Continued.

ABOVE 55 YEARS. (Mean force, 5.)								TOTALS. (Mean force, 1,031.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
								1	1.96						
								2	.93						
								3	2.90						
								19	18.42						
								5	4.84						
								6	5.81						
								4	3.87	1	.96			1	.96
1	200							57	55.28					1	.96
1	200							7	6.78	2	1.93			1	.96
1	200							28	27.15						
								1	.96					1	.96
1	200							16	15.51						
								9	8.72						
								14	13.57					1	.96
1	200							7	6.78						
								1	.96						
5	1,000							155	150.33	3	2.90			5	4.84
11	2,200							978	948.59	47	45.58	2	1.93	9	8.72

SANITARY CONDITION
OF THE
ASIATIC STATION.





ASIATIC SQUADRON.

The squadron employed on the Asiatic station in the year 1882 was composed of 7 vessels, viz: Richmond, second-rate, flag-ship; Swatara, Juniata, Monocacy, Ashuelot, and Alert, third rates; and the Palos, fourth-rate. The strength of the squadron was 1,284, or corrected for time 994. The Alert, Juniata, and Swatara were on the station but a portion of the year:

The total number of admissions, including those remaining from the previous year, was.....	1,014	=	1,020.12 $\frac{0}{0}$
Discharged, recovered	901	=	909.65 $\frac{0}{0}$
Invalided:			
To hospital.....	85	=	85.51 $\frac{0}{0}$
From service	1	=	1.00 $\frac{0}{0}$
Died	4	=	4.02 $\frac{0}{0}$
Continued.....	23		

The total loss of time amounted to 9,403 sick days, The daily average number sick was, absolute, 25.76, and relative 25.91 $\frac{0}{0}$; the average duration of treatment was 9.27 days.

As compared with the statistics of last year from this station it will be observed that the ratio of admissions is almost precisely that of 1881, which was 1,022.68 $\frac{0}{0}$, while the ratio of daily sick was slightly increased; that of last year having been 23.70 $\frac{0}{0}$. The period of treatment was more prolonged, 8.46 days being the average of last year.

In the English squadron the ratios were: Admissions, — $\frac{0}{0}$; invaliding, — $\frac{0}{0}$; death, $\frac{0}{0}$. In the German squadron the ratio of admissions was 1,108.2 $\frac{0}{0}$, and the average duration of treatment 17.7 days.

The followinig table exhibits the daily ratio of sick per thousand, as they occurred on the several ships of the station, those of previous years being also given for comparison :

Ships.	1879.	1880.	1881.	1882.
Juniata				83. 65
Alert	7. 73		28. 24	77. 62
Swatara			26. 20	36. 54
Richmond	16. 76		24. 09	34. 89
Ashuelot	46. 29		24. 92	21. 41
Palos	19. 78		20. 17	20. 61
Monocacy	29. 54		15. 22	13. 04

The daily ratio of sickness per thousand, as distributed among the various classes of disease, is exhibited in the following table, which also shows them for several preceding years:

	1879.	1880.	1881.	1882.
GENERAL DISEASES:				
Zymotic	1.56	.91	2.32	1.86
Constitutional	4.58	3.75	9.47	.....
LOCAL DISEASES:				
Diseases of the nervous system	.89	.86	.72	.82
Diseases of the eye	.51	.59	.43	.26
Diseases of the ear	.03	.01	.06	.04
Diseases of the teeth	.03	.03	.03	.02
Diseases of the circulatory system	.77	.31	.06	.05
Diseases of the respiratory system	3.12	.78	1.60	2.33
Diseases of the digestive system	2.83	2.69	3.60	2.22
Diseases of the genito-urinary system	3.17	2.84	2.95	3.52
Diseases of the locomotive system	.17	.14	.12	.03
Diseases of the integumentary system	2.08	1.65	2.60	3.09
Diseases of the absorbent system	.78	1.22	1.90	1.32
Non-malignant tumors and cysts	.09	.11	.04	.08
POISONS	1.50	.30	.33	2.81
VIOLENT DISEASES AND DEATHS	3.79	3.37	3.51	4.09

The ratio of invaliding occurred as indicated as follows, compared with preceding years:

	1880.	1881.	1882.
GENERAL DISEASES:			
Zymotic	6.43	8.50	2.01
Constitutional	11.02	10.39	26.15
LOCAL DISEASES:			
Diseases of the nervous system	3.67	3.78	8.04
Diseases of the eye	4.59	1.89	1.00
Diseases of the circulatory system	5.51	.94	2.01
Diseases of the respiratory system	6.43	12.28	19.11
Diseases of the digestive system	8.27	11.34	7.04
Diseases of the genito-urinary system	7.35	2.83	3.01
Diseases of the integumentary system	1.83	4.72	4.02
POISON	.91	1.89	1.00
VIOLENT DISEASES	7.35	5.67	7.04

The invaliding occurred among the ships as follows, the number being given with the ratio per thousand:

Alert	20 = 215.05
Ashuelot	15 = 111.94
Juniata	7 = 170.00
Monocacy	9 = 59.60
Palos	3 = 61.22
Richmond	19 = 57.75
Swatara	12 = 60.91

The deaths occurred in the following groups:

Diseases of the circulatory system	1
Diseases of the digestive system	1
Violence	2

GENERAL DISEASES.

ZYMOTIC GROUP.

The number of cases of zymotic disease occurring in the squadron was 99, and the ratio of admissions was $99.55\frac{0}{0}$, a decided diminution from that of last year, which was 128.54. There was a resulting loss of service of 677 days, and the daily average ratio of sick was $1.86\frac{0}{0}$. Two cases were invalided to hospital and 3 continued. The average duration of treatment was 1.83 days.

In the English squadron the ratios were: Admissions, $\frac{0}{00}$; invaliding, $\frac{0}{00}$; death, $\frac{0}{00}$. In the German squadron the admission ratio for zymotic and constitutional diseases was $289.6\frac{0}{00}$, and the average duration of treatment 21.5 days.

The zymotic diseases occurred on the several ships in the following ratios per thousand during four years:

Ships.				
	1879.	1880.	1881.	1882.
Palos.....	173.91	115.38	122.80	142.85
Richmond.....	35.89	52.19	108.40	130.69
Alert.....	18.38	73.61	181.81	118.27
Juniata.....				97.56
Swatara.....		93.89	133.33	81.21
Monocacy.....	165.74	75.14	83.86	72.86
Ashuelot.....	112.06	89.43	171.86	52.23

Febricula.—Two cases were reported from the Alert and 1 from the Juniata, which returned to duty after an average period of 5 days.

Febris continua simplex.—A total of 13 cases of this febrile disturbance occurred, with a ratio of $13.07\frac{0}{00}$, as against $9.45\frac{0}{00}$ last year. They were distributed among the Alert, Monocacy, and Juniata. The loss of service was 104 days, and the daily ratio of sickness was $.28\frac{0}{00}$.

Febris enterica.—The Ashuelot and Juniata each returned a case of typhoid fever, both cases being still under treatment at the close of the year.

Febris intermittens.—There were returned 32 cases of this disease, a ratio of $32.19\frac{0}{00}$, one-half less than that of last year, $65.21\frac{0}{00}$. The loss of service was 144 days, and the daily average ratio of sickness was $.39\frac{0}{00}$. All the cases were discharged to duty, with an average loss of service of 4.5 days.

Febris remittens.—The number of cases occurring under this head was 37, the ratio being $37.22\frac{0}{00}$, as against $30.24\frac{0}{00}$ last year. Thirty of the cases occurred on the Richmond, from which ship and the Monocacy single cases were invalided to hospital. The average daily ratio of sick was $.85\frac{0}{00}$, and the total loss of service was 311 days, making an average of 8.4 for each case.

Parotitis.—This affection appeared in single cases on the Monocacy and Richmond, and were briefly under treatment.

Vaccina.—Of the vaccinations in the squadron, given in the following table, but 2 cases required treatment, and these occurred on the Palos and Monocacy.

Vessel.	Presenting good cicatrices.		No evidence of previous vaccination.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Ashuelot.....	37	7	15	8	2	4	73
Monocacy.....	3	4	0	0	0	0	7
Palos.....	12	17	0	0	0	0	29
Swatara.....	23	15	6	4	1	3	52
Total.....	75	43	21	12	3	7	161
Per cent. of cases.....	73.2		20.4		6.2		
Per cent. of successful.....	63.5		63.6		30.		61.4

CONSTITUTIONAL DISEASES.

There were returned 155 cases of these diseases, making a ratio of $155.94\frac{0}{00}$, an increase from $119.09\frac{0}{00}$ last year. The number of sick days resulting was 2,113, and the daily average sick rate $5.81\frac{0}{00}$. Twenty-six cases were invalided to hospital, with a ratio of $26.15\frac{0}{00}$, and 5 were continued. The average duration of treatment was 13.63 days.

In the English squadron the ratios were: Admissions, $—\frac{0}{00}$; invaliding, $—\frac{0}{00}$; death, $—\frac{0}{00}$.

The ratios per thousand of these diseases on the ships of the squadron stood as follows:

Ships.	1879.	1880.	1881.	1882.
Alert	11. 91	104. 29	233. 76	290. 32
Palos	86. 95	96. 15	52. 63	265. 30
Richmond	87. 17	57. 69	59. 62	161. 09
Swatara		159. 62	128. 70	142. 13
Monocacy	125. 73	115. 60	109. 66	119. 20
Ashuelot	215. 51	89. 43	171. 86	97. 01
Juniata				73. 17

Adynamia.—The cases of this affection were reported from the ships as follows: Alert, 4; Palos, 3; Swatara, 2; giving a ratio of $9.05\frac{0}{00}$, as against $20.79\frac{0}{00}$ in 1881. The loss of service was 32 days, and the daily average ratio of sick $.08\frac{0}{00}$. One case was invalided from the Swatara.

Anæmia.—The Swatara had 1 case which was under treatment 6 days and returned to duty.

Hydrops.—The Richmond reported 1 case, which recovered after 39 days of treatment.

Lumbago.—There were 11 cases of this affection returned from the Richmond; 4 from the Swatara, and 2 from the Alert, and the ratio of admissions was $18.10\frac{0}{00}$. The loss of service was 133 days, and the daily ratio of sick was $.36\frac{0}{00}$, while the average duration of treatment was 7.38 days.

Rheumatismus.—The number of cases of acute rheumatism was 18, and of the chronic disease 43, making the respective ratios of $18.10\frac{0}{00}$ and $43.25\frac{0}{00}$. Last year they were $17.95\frac{0}{00}$ and $22.68\frac{0}{00}$, showing a slight increase in the former and a very considerable increase in the latter disease. The loss of service from the acute disease was 365 days, and from the chronic form 570 days, and the invaliding was 2 cases of the former and 11 of latter. The Richmond was the chief sufferer from the acute variety, and the Swatara from the chronic, and the Juniata and Palos returned very little of either.

Syphilis.—Of primary syphilis there were rated 23 cases, and of the secondary disease 40, giving a ratio in each case of $23.13\frac{0}{00}$ and $40.24\frac{0}{00}$, an increase in both forms from last year, when the respective ratios were $16.06\frac{0}{00}$ and $26.46\frac{0}{00}$. The loss of service from the former affection was 394 days, and from the latter, 541; making a total loss from syphilis of 935 days. The respective daily sick rates from the two diseases were $1.07\frac{0}{00}$ and $1.48\frac{0}{00}$, and the average duration of treatment of the primary disease was 17.13 days and of the secondary 13.52. Two cases of the first were invalided, and 8 cases of the last, while 1 case of each remained under treatment. The Alert and Monocacy were the greatest relative sufferers.

LOCAL DISEASES.

DISEASES OF THE NERVOUS SYSTEM.

This group of diseases contained returns of 39 cases, the ratio of which was $39.23\frac{0}{0}$, as against $34.02\frac{0}{0}$ last year. Of these 8 were invalided, or $8.04\frac{0}{0}$. The loss of service was 301 days, and the daily average sick rate, $.82\frac{0}{0}$, while the average duration of treatment was 7.71 days.

The ratio per thousand of nervous diseases as reported from the ships are given below, compared with those of the preceding years :

Ships.	1879.	1880.	1881.	1882.
Palos	65.21	38.46	17.54	81.63
Ashuelot.....	43.10	.....	39.06	74.62
Richmond.....	48.71	19.23	46.65	45.69
Swatara.....	.....	75.11	20.51	35.63
Alert.....	18.38	52.21	51.94	21.50

Cephalalgia.—Sixteen cases of this affection gave a ratio of $16.09\frac{0}{0}$, as against $9.45\frac{0}{0}$ last year. The daily sick rate was $.12\frac{0}{0}$, and the loss of service 44 days. All returned to duty; the Ashuelot and Swatara suffered chiefly.

Epilepsia.—The Richmond and Ashuelot each returned a case of this affection, which were sent to hospital for disposition.

Mania.—There was a single case of this malady for the Richmond, which was invalided promptly.

Nausea marina.—Eleven days' loss of service resulted from 3 cases of this affection, occurring on as many ships.

Neuralgia.—Twelve cases of neuralgia gave a ratio of $12.07\frac{0}{0}$, as against $9.45\frac{0}{0}$ last year. There was a resulting loss of service of 124 days. The daily average ratio of sick was $.33\frac{0}{0}$, and the average duration of treatment was 10.33 days. Four cases, a ratio of $4.02\frac{0}{0}$ were invalided to hospital. The Ashuelot, Richmond, and Palos reported most of the cases.

Pleurodynia.—Two cases were returned from the Ashuelot and Richmond, the former of which was invalided to hospital. The loss of service was 15 days.

Vertigo.—Two admissions on the Richmond were mentioned, and the cases promptly returned to duty.

DISEASES OF THE EYE.

Thirteen cases of eye diseases came under notice, the principal affection being conjunctivitis, of which there were 8 on the Richmond and 1 each on the Swatara and Alert. Two cases of iritis on the Monocacy, and 1 of ophthalmia on the Richmond made up the total, the latter being invalided. The ratio of admissions was $13.07\frac{0}{0}$, as against $17.95\frac{0}{0}$ last year, and the total loss of service was 95 days, or $.730$ days for each case. The daily average sick rate was $.26\frac{0}{0}$.

DISEASES OF THE EAR.

The cases in this class comprised 2 of otitis occurring on the Richmond, and 1 of otorrhœa on the Juniata. The admission rate was $3.01\frac{0}{0}$, as against $4.72\frac{0}{0}$ last year, and the total loss of service was 17 days.

DISEASES OF THE TEETH.

Under this head were returned only 3 cases, all of odontalgia, 2 occurring on the Richmond and 1 on the Alert, the latter of such a character as to unfit the subject for the service, from which he was discharged. The average loss of service was 2.66 days.

DISEASES OF THE CIRCULATORY SYSTEM.

Six cases were included under this head, with a ratio of $6.01\frac{0}{0}$, nearly the same as last year, when it was $5.67\frac{0}{0}$. A case of aneurism was returned from the Ashuelot, the patient dying from its sudden rupture. Four cases of palpitation were noted on the Monocacy and other ships, of which 2 were invalided, and there was a single case of phlebitis on the Richmond. The total loss of service for the class was 19 days.

DISEASES OF THE RESPIRATORY SYSTEM.

These affections occurred in 63 cases, contributing a ratio of $63.38\frac{0}{0}$ nearly that of last year, $68.99\frac{0}{0}$. There was a resulting loss of service of 842 days, and a daily average ratio of sick of $2.33\frac{0}{0}$. Nineteen cases were invalided to hospital and 1 was continued. The average duration of treatment was 13.36 days.

In the English squadron the ratios were: Admission, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $28.2\frac{0}{0}$, and the average duration of treatment 15.8 days.

The table herewith given shows the ratios of the diseases of the respiratory organs on the several ships, a comparison with those of previous years being afforded:

Ships.	1879.	1880.	1881.	1882.
Palos	65.21	96.15	105.26	163.26
Alert	23.71	55.21	58.43	75.26
Ashuelot	172.41	56.91	70.30	67.16
Swatara		65.72	35.76	60.91
Richmond	15.28	43.84	79.39	57.75
Monocacy	34.28	34.68	90.31	46.35
Juniata				24.39

Asthma.—Seven cases of asthma gave a ratio of $7.04\frac{0}{0}$, and a loss of service of 20 days. Three cases occurred on the Ashuelot, and 2 on the Richmond and Swatara, respectively. The loss of service was 145 days, and the daily average ratio of sick was $.39\frac{0}{0}$.

Bronchitis acuta.—There were 14 cases of this affection, and a ratio of $14.08\frac{0}{0}$, as against $25.51\frac{0}{0}$ last year. The loss of service was 92 days, and the daily average number of sick $.25\frac{0}{0}$. One case was invalided and the remainder returned to duty after an average duration of treatment of $6.57\frac{0}{0}$ days. Nine cases occurred on the Richmond and 2 each on the Swatara and Ashuelot.

Bronchitis chronica.—Five cases were reported, 1 from the Richmond and 4 from the Swatara. The ratio of admissions was $5.03\frac{0}{0}$, and the loss of service was 41 days. Four recovered after an average period of 8.2 days, and 1 was continued.

Catarrhus.—Eighteen cases were recorded, a ratio of $18.10\frac{0}{0}$, as against $16.05\frac{0}{0}$ last year. The daily average ratio of sick was $.21\frac{0}{0}$, and the loss of service 80 days. The Monocacy and Palos yielded the largest number of cases, 6 each.

Phthisis pneumonia chronica.—The large number of 16 cases were included in the returns for 1881, from the following ships: Palos, 5; Ashuelot, 4; Swatara, 3; Richmond, 2; Monocacy and Palos each, 1. These were all invalided with the exception of 2 cases on the Richmond and Swatara. The ratio of admissions was $16.09\frac{0}{0}$, of the daily sick $1.21\frac{0}{0}$, and of the invalided $14.08\frac{0}{0}$. The loss of service was 445 days, or 27.81 for each case.

Pleuritis.—The Richmond and Ashuelot each returned 1 case, which were returned to duty after an average loss of service of 18 days.

Pneumonia.—The Alert reported 1 case, which was invalided to hospital on the third day.

DISEASES OF THE DIGESTIVE SYSTEM.

The returns for the year included 160 cases of these diseases, giving a ratio of $160.96\frac{0}{0}$, as against $202.26\frac{0}{0}$ last year, showing a material falling off. There was a loss of service of 807 days, and a daily ratio of sick of $2.22\frac{0}{0}$. Seven cases were invalided, and 1 died, while 2 were continued.

In the English squadron the ratios were: Admission, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was $182.2\frac{0}{0}$, and the average duration of treatment 6.0 days.

The diseases of this class occurred in the various ships as indicated by the following ratios, those of preceding years being given for comparison:

Ships.	1879.	1880.	1881.	1882.
Alert	29.65	147.23	331.14	365.59
Richmond	112.82	140.10	511.76	194.52
Palos	434.78	17.30	228.07	163.26
Swatara		474.17	220.50	131.97
Ashuelot	344.82	121.95	156.24	111.94
Monocacy	160.02	127.16	199.98	86.09

Cholera morbus.—This disease occurred chiefly on two ships, the Alert and Ashuelot. Seven cases were noted; the ratio given was $7.04\frac{0}{0}$, the loss of service 20, and the average duration of treatment 2.85 days.

Colica.—There were returns of 25 cases, of which more than one-half (14) occurred on the Richmond, and 5 on the Alert. The ratio was $28.15\frac{0}{0}$, and the daily sick rate was $.23\frac{0}{0}$. All the cases recovered with 1 exception, which was continued, and the total loss of service was 87 days, or 3.48 for each case.

Constipatis.—Two cases were noted on the Ashuelot and Palos, which returned to duty after 25 days each.

Diarrhœa acuta.—The reports indicated 54 cases, of which 27 occurred on the Richmond, 11 on the Alert, and 9 on the Swatara. The ratio was $54.32\frac{0}{0}$, as against $62.38\frac{0}{0}$ last year, and the loss of time was 223 days, while the daily sick rate was in the ratio of $.61\frac{0}{0}$. One case was invalided, and the remainder recovered after an average treatment of 4.12 days.

Dysentery.—Five cases of the acute form of this disease occurred, and 3 of the chronic, causing the loss of 30 days and 26 days, respectively. Two of the latter were invalided to hospital, and 1 died.

Dyspepsia.—Nine cases were returned, of which 5 occurred on the Alert, and 3 on the Richmond; the ratio was $9.05\frac{0}{0}$, and the total loss of service 98 days. All recovered after an average duration of 10.88 days.

Fistula in ano.—There were 2 admissions for this trouble on the Ashuelot, the subjects being finally invalided to hospital.

Gastritis.—The Richmond returned 2 cases, which speedily recovered.

Hæmorrhoids.—Six cases were noted on various ships, which returned to duty after an average period of 5.33 days of treatment.

Hernia.—The Richmond reported 2 cases, and the Alert and Ashuelot each 1, all of which, with the exception of the last, were invalided. The loss of service was 105 days, and the daily ratio of sickness was $.28\frac{0}{0}$.

Icterus.—Three cases occurred on the Alert, Monocacy, and Richmond, a ratio of $3.01\frac{0}{0}$. The loss of time was 23 days, and all recovered.

Pharyngitis.—The Alert returned 3 cases, and the Richmond 3, making a ratio of $6.03\frac{0}{0}$. The loss of service was 27 days, and the average duration of treatment 4.5 days. There was no invaliding.

Stomatitis.—The single case was mentioned in the returns of the Ashuelot as having been under treatment for 6 days.

Tonsillitis.—Thirty cases were noted, of which 11 occurred on the Swatara, 8 on the Richmond, and 7 on the Monocacy. The ratio of admission was $30.18\frac{0}{0}$, and of the daily sick $.31\frac{0}{0}$, while the loss of service was 115 days, or 3.83 for each case. All returned to duty.

Vermes.—The Palos returned a case, which was 3 days under observation and recovered.

DISEASES OF THE GENITO-URINARY SYSTEM.

The total number of cases falling under this head was 99, giving a ratio of $99.59\frac{0}{0}$, a small increase over that of last year, $96.40\frac{0}{0}$. Of these, 3 cases, or $3.01\frac{0}{0}$, were invalided to hospital, and 5 were continued. The total loss of service amounted to 1,280 days, and the daily average sickness was in the ratio of $3.52\frac{0}{0}$.

In the English squadron the ratios were: Admission, $—\frac{0}{0}$; invaliding, $—\frac{0}{0}$; death, $—\frac{0}{0}$. In the German squadron the admission ratio was, for venereal diseases only, $289.7\frac{0}{0}$, and the average duration of treatment 22.1 days.

The subjoined ratios indicate the distribution of these cases among the ships of the squadron, and they are compared with the previous years:

Ships.	1879.	1880.	1881.	1882.
Alert.....	18.38	67.42	181.81	161.29
Richmond.....	53.84	71.40	67.75	127.65
Ashuelot.....	362.06	40.65	46.87	104.48
Swatara.....		79.81	117.94	91.37
Palos.....	130.43	38.46	122.80	61.22
Juniata.....				48.78
Monocacy.....	91.17	80.92	83.86	33.11

Balanitis.—The Richmond noted 1 case, which resulted in the loss of 54 days, and finally returned to duty.

Colica nephritica.—Two cases on the Richmond were each under treatment for 10 days.

Chancroides.—There were 12 admissions for this malady, contributing a ratio of $12.07\frac{0}{0}$, as against $11.34\frac{0}{0}$ in 1881. The loss of time amounted to 217 days, and the ratio of daily sick was $.39\frac{0}{0}$. Ten cases returned to duty, and the remaining 2 were continued. These cases occurred as follows: Richmond 7, Swatara 4, Palos 1, and the remaining ships were exempt.

Cystitis.—A single case was noted on the Richmond, which was promptly relieved.

Dysuria.—The Ashuelot contributed this case, and it soon returned to duty.

Epididymitis.—The Ashuelot also returned 5 cases of this trouble, which recovered after an average period of 6.8 days, the ratio of admissions being $5.08\frac{0}{0}$.

Gonorrhœa.—There were admitted 35 cases of this affection, a ratio of $35.21\frac{0}{0}$, an increase over that of last year, which was $29.30\frac{0}{0}$. The loss of service was 418 days, and the daily average ratio $1.14\frac{0}{0}$; 1 case was continued. The Richmond reported 21 cases, the Alert 6, and the Ashuelot 5. The Monacacy and Juniata were exempt.

Orchitis.—The Swatara gave returns of 12 cases, the Richmond 8 and the Monocacy 5. Thirty-one cases in all gave a ratio of $31.18\frac{0}{0}$, and the resulting loss of service was 394 days. Two cases were invalided to hospital, and the average period of treatment on board was 12.70 days.

Phymosis.—One case of this trouble was mentioned in the returns of the Alert, which was 23 days under treatment.

Prostatitis.—The Juniata reported 1 case, which recovered after 25 days of observation.

Urethræ strictura.—There were 7 cases of urethræ strictura, a ratio of $7.04\frac{0}{0}$, as against $4.72\frac{0}{0}$ last year. Four occurred on the Alert, 2 on the Ashuelot, and 1 on the Richmond. One was invalided. The loss of time was 75 days, and the average duration of treatment was 10.71 days.

Varicocele.—The Juniata and Richmond reported single cases, 1 of which was discharged to duty and the other continued. The number of sick days was 14.

DISEASES OF THE LOCOMOTIVE SYSTEM.

But 3 cases were returned under this head, 2 admissions being for arthritis on the Monocacy, and 1 for synovitis on the Alert. All the cases were restored to duty, with an average loss of service of 4.33 days. The ratio of admissions was $3.01\frac{0}{0}$, against $8.50\frac{0}{0}$ in 1881, and the entire loss of service was 13 days.

DISEASES OF THE INTEGUMENTARY SYSTEM.

This class of diseases contained 131 cases, a ratio of $131.78\frac{0}{0}$, a considerable diminution from that of last year, $206.80\frac{0}{0}$. The resulting loss of service was 1,126 days, and the daily ratio of sick was $3.09\frac{0}{0}$. Five cases were invalided to hospital and 2 continued, while the average duration of treatment of the remainder amounted to 8.59 days.

In the English squadron the ratios were: Admissions,— $\frac{0}{0}$; invaliding,— $\frac{0}{0}$; death,— $\frac{0}{0}$. In the German squadron the ratio of admissions 72.4 days, and the average duration of treatment 17.3 days.

The occurrence of these affections is shown in the following table of comparative ratios:

Ships.	1879.	1880.	1881.	1882.	Ships.	1879.	1880.	1881.	1882.
Richmond	76.92	79.67	86.72	194.52	Swatara .....	.....	201.87	158.20	116.75
Juniata .....	.....	.....	.....	170.73	Ashuelot .....	.....	81.20	70.30	82.08
Alert	35.58	18.40	255.83	161.29	Monocacy	154.31	86.70	103.21	26.49
Palos	43.47	38.46	122.20	142.85					

Abscessus.—Twenty cases of this affection were returned, giving a ratio of $20.12\frac{0}{0}$, as against $27.04\frac{0}{0}$ last year. Of these, 1 was invalided to hospital and 2 remained under treatment. The daily average ratio of sickness was $.25\frac{0}{0}$ and the total loss of service was 94 days, or 4.7 for each case.

Anthrax.—One case occurred on the Richmond, which was under treatment 10 days and recovered.

Ecthyma.—The Ashuelot noted 1 case, which was briefly relieved from duty.

Eczema.—The Richmond's returns included 2 cases of this eruption, which were each under treatment for 10 days before being discharged to duty.

Erythema.—The same ship returned 1 case of this trouble, which involved a loss of service of 20 days.

Furunculus.—Sixty cases of this trouble gave a ratio of $60.36\frac{0}{0}$, an increase over that of the preceding year, which was $40.64\frac{0}{0}$. The number of daily sick was in the ratio of $.98\frac{0}{0}$, and the loss of service amounted to 360 days, the average duration having been 6 days. The cases occurred chiefly as follows: Richmond, 30; Swatara, 16; Alert, 7; and Palos, 4.

Herpes.—Two cases were noted, 1 on the Richmond and the other on the Juniata; the latter being invalided to hospital, and the loss of time was 18 days.

Onychia.—A single case occurred on the Alert, which was discharged to duty after 9 days of treatment.

Paronychia.—Eleven cases made up the total of this disease, the ratio being $11.06\frac{0}{0}$, and the average daily sick rate $.33\frac{0}{0}$. The number of sick days was 121, and the average duration of treatment 11 days. Two cases were invalided.

Ulcus.—There were 29 cases of ulcer treated; a ratio of $29.17\frac{0}{0}$, more than double that of last year, $12.98\frac{0}{0}$. Of these, 1 was invalided to hospital, and the remainder were returned to duty, after an average duration of treatment of 15.75 days. The average daily ratio of sickness was $1.25\frac{0}{0}$, and the total loss of service 457 days. The Richmond had 18 cases and the Alert and Swatara each 3.

Urticaria.—The Swatara and Ashuelot each reported 1 case, which returned to duty after an average period of 5.5 days.

DISEASES OF THE ABSORBENT SYSTEM.

The cases under this head included 25 of adenitis, giving a ratio of $25.15\frac{0}{0}$, as against $35.91\frac{0}{0}$ last year. The average ratio of daily sick was $1.32\frac{0}{0}$, and the total loss of service 483 days. Of the total number, 4 were invalided to hospital, and 2 were continued. In the distribution of these cases, 11 were observed on the Richmond, 4 on the Palos, and 3 each on the Alert and Ashuelot.

POISONS.

There were returned 36 cases of sickness from the use of alcoholic drinks, which made up the total of this class. The largest ratio of this class was contributed by the Swatara, which reported 18 cases, or $91.37\frac{0}{0}$. Next comes the Richmond with 10 cases, or $30.39\frac{0}{0}$, and the Monocacy, with 4, or $26.49\frac{0}{0}$. The ratio of admissions for this class was $36.21\frac{0}{0}$ as against $40.64\frac{0}{0}$ last year, while the average daily rate was $.28\frac{0}{0}$. There was a loss of time of 105 days, and the average duration of treatment was 2.91 days. The cases falling under this head were classified thus: Alcoholismus, 32; delirium tremens, 1; ebrietas, 3. All were returned to duty except the case of delirium tremens, which was invalided to hospital from the Monocacy.

VIOLENT DISEASES AND DEATHS.

In this class were grouped 176 cases, giving a ratio of $177.06\frac{0}{0}$, as against $148.30\frac{0}{0}$ last year; and an average daily sick-rate of $4.09\frac{0}{0}$. Of these, 7 cases, or $7.04\frac{0}{0}$ were invalided to hospital; 2 died and three

were continued. The loss of service amounted to 1,486 days, and the average duration of treatment was 8.44 days.

In the English squadron the ratios were: Admissions, $\frac{0}{0}$; invaliding, $\frac{0}{0}$; deaths, $\frac{0}{0}$. In the German squadron the ratio of admissions was $118.1\frac{0}{0}$, and the average duration of treatment 12.5 days.

The following comparison of ratios per thousand will show the distribution of the cases on the different ships:

Ships.	1879.	1880.	1881.	1883.	Ships.	1879.	1880.	1881.	1882.
Juniata				268.29	Ashuelot	94.82	81.30	109.36	126.86
Richmond	182.05	126.37	151.76	243.16	Palos	136.43	196.16	157.89	102.04
Swatara		366.19	141.01	187.81	Monocacy	120.01	98.26	116.11	79.47
Alert	47.44	153.37	84.40	150.54					

Abrasio.—Eight cases of this injury were returned from the Richmond, and 2 from the Juniata, a ratio of $10.06\frac{0}{0}$. They gave a loss of service of 84 days, and a daily sick rate in the ratio of $.23\frac{0}{0}$.

Ambustio.—Five cases occurred, 4 on the Richmond and 1 on the Swatara, which were under treatment for an average period of 10.6 days and recovered.

Concussio spinalis.—One case on the Monocacy was reported, which was immediately fatal.

Congelatio.—The Swatara returned 2 cases of frost bite, each of which was treated 2 days.

Contusio.—There were 56 cases of this injury reported, or $56.33\frac{0}{0}$, an increase over that of last year $34.96\frac{0}{0}$. Of these 2 were invalided to hospital and 1 remained. The loss of service was 420 days, and the daily ratio $1.15\frac{0}{0}$. These injuries were distributed in pretty equal ratio among the ships, except the Monocacy, which was exempt.

Fractura.—The fractures which were reported were 2 on the Richmond, of which 1 was invalided, and 1 each on the Alert and Ashuelot. One hundred days were lost, and the average ratio of sick daily was $.27\frac{0}{0}$. All recovered on board with one exception, which was invalided.

Luxatio.—Three cases of dislocations occurred, which gave a ratio of $3.01\frac{0}{0}$, and a loss of service of 39 days.

Stremma.—The ratio afforded by 35 admissions under this head was $35.21\frac{0}{0}$, as against $30.24\frac{0}{0}$ last year. The daily amount of sickness was in the ratio of $56\frac{0}{0}$, and the loss of service was .207 days. All the cases recovered on board after an average period of 5.91 days.

Vulnus contusum.—There were 24 admissions for this injury, giving a ratio of $24.14\frac{0}{0}$, while that of last year was $30.24\frac{0}{0}$. The loss of service was 182 days, and the average duration of treatment 7.58 days. The Swatara gave the largest number, 12, and the Richmond stood next with 6.

Vulnus incisum.—Nineteen cases gave a ratio of $19.11\frac{0}{0}$, as against $13.23\frac{0}{0}$ last year, of which 10 happened on the Richmond and 4 on the Alert. The loss of service was 155 days, and the daily average ratio $.42\frac{0}{0}$. All recovered on board but 1 case, which was invalided.

Vulnus laceratum.—There were 14 cases of this form of wound, the same number as last year. The Richmond returned 5 cases and the Monocacy 5, and 2 cases were invalided to hospital. The ratio of admissions was $14.08\frac{0}{0}$, while that of last year was $13.23\frac{0}{0}$, and the loss of service was 151 days, or 10.78 for each case.

Vulnus punctum.—Three cases were returned from the Swatara, of which 1 died and 1 was invalided. The loss of time was 86 days, or 28.66 for each case.

NAVAL HYGIENE.

ALERT.

This vessel was in service only 209 days of the year. In the first quarter she was engaged in cruising along the coast of China to Java and Siam. From thence she returned to Japan in the second quarter, and soon after sailed for San Francisco, where she reached in August. During the year she was in port 127 days and at sea 82 days.

Eleven cases were entered on this ship as with zymotic diseases, giving a ratio of $118.27\frac{0}{0}$, standing third on the list, while last year she was first in the order of frequency. She had but 1 case of intermittent fever, while there were 8 of simple continued fever. The loss of service was 65 days, and the daily average sick rate was $3.33\frac{0}{0}$.

The constitutional cases occurred in greater frequency than on any other ship, as was the case last year, the ratio given by 27 cases being $290.32\frac{0}{0}$ as against $233.76\frac{0}{0}$ in 1881. Of these 8, or $86.02\frac{0}{0}$, were invalided to hospital. The loss of time amounted to 580 days, and the daily average ratio of sickness was $29.78\frac{0}{0}$, while the average duration of treatment was 21.48 days. The cases of rheumatism and syphilis, included, were 7 of the former and 13 of the latter.

But 2 cases of nervous diseases were noted, and these were of a trivial character, giving a ratio of $21.50\frac{0}{0}$, and a loss of 5 days. This was in strong contrast with last year, when the ratio was $51.94\frac{0}{0}$.

Diseases of the respiratory system contributed a ratio of $75.26\frac{0}{0}$ as against $58.43\frac{0}{0}$ last year. The loss of service amounted to 133 days, and the average number sick daily was in the ratio of $6.77\frac{0}{0}$. The large number of cases of phthisis, 5, and a single case of pneumonia were the chief factors of the class, all being invalided to hospital.

In the class of digestive diseases the ratio was very greatly larger than that of any other ship, or $365.59\frac{0}{0}$ as against $331.14\frac{0}{0}$ last year, the number of cases being reported as 34. The daily average ratio of sickness was $13.22\frac{0}{0}$, and the loss of service 258 days. Three cases were invalided to hospital, and there was 1 death from chronic dysentery. The average duration of treatment was 7.58 days.

The cases of diseases of the genito-urinary system were 15 in number, giving a ratio of $161.79\frac{0}{0}$ as against $181.81\frac{0}{0}$ in the preceding year, and again in this case this ship suffered to a larger extent than any other. The cases reported were 6 of gonorrhœa, and 4 each of orchitis and urethral stricture.

Integumentary diseases occurred in 15 cases, the ratio being $161.29\frac{0}{0}$ as against $255.83\frac{0}{0}$ last year. The daily average sick rate was $6.45\frac{0}{0}$ and the loss of service 127 days. One case of paronychia was invalided to hospital.

Fourteen cases of injury gave a ratio of $150.54\frac{0}{0}$, nearly twice that of last year, $84.40\frac{0}{0}$. The daily ratio of sick was $4.94\frac{0}{0}$, and the total loss of service was 97 days, or 6.92 for each case. One case was invalided and there was 1 death.

ASHUELOT.

The first portion of the year was spent by this vessel on the northern coast of China, at Tien-Tsin. Returning to Japan in the second quarter, she remained there during the remainder of the year, cruising among the various ports of that country. She was at sea during the year 21 days.

In the zymotic class of diseases this ship reported 7 cases, a ratio of $52.23\frac{0}{0}$, a very large reduction as compared with last year, when it was $171.86\frac{0}{0}$. The loss of service was 40 days, and the daily average ratio $.74\frac{0}{0}$. The cases were 5 of intermittent fever, 1 of remittent, and 1 of typhoid fever.

In the constitutional group were included 13 cases or $97.01\frac{0}{0}$, against a large reduction of that of the previous year, which was $179.67\frac{0}{0}$. The cases were 7 of constitutional syphilis and 5 of rheumatism. The total loss was 227 days and the daily ratio of sick was $4.62\frac{0}{0}$. Two cases, a ratio of $14.02\frac{0}{0}$, were invalided; the average duration of treatment was $17.46\frac{0}{0}$.

The nervous diseases were 10 in number, and gave a ratio of $74.62\frac{0}{0}$, as against $39.06\frac{0}{0}$ last year; of these 4 cases, or $29.85\frac{0}{0}$, were invalided to hospital. The number of sick days was 84, and the daily average ratio of sick, $1.71\frac{0}{0}$, while the average period of treatment was 8.4 days.

The cases coming under the head of diseases of the respiratory system were 9 in number, and the ratio was $67.16\frac{0}{0}$, nearly the same as that of last year, $67.30\frac{0}{0}$. The loss of service was 189 days, and the average daily number of sick was in the ratio of $3.73\frac{0}{0}$. The average duration of treatment was 20.77 days.

The group of diseases of the digestive system yielded 15 cases, and a ratio of $111.94\frac{0}{0}$, as against $156.74\frac{0}{0}$ in 1881. There was a loss of time of 54 days, and a daily average ratio of $1.04\frac{0}{0}$. One case was invalided to hospital, and the average duration of treatment was 3.6 days.

Diseases of the genito-urinary system yielded 14 cases, of which the ratio was $104.48\frac{0}{0}$. One case of stricture was invalided, and the daily average ratio of sick was $2.23\frac{0}{0}$. The average duration of treatment was 7.92 days.

There were 11 cases of integumentary diseases, or $82.08\frac{0}{0}$, a very large diminution from that of last year, $255.83\frac{0}{0}$. It was made up chiefly of 5 cases of ulcer and 2 each of paronychia and abscess. The time lost amounted to 158 days, and the average number sick daily was in the ratio of $3.20\frac{0}{0}$. The average duration of treatment was 14.36 days, and 1 case of ulcer was invalided.

Injuries numbered 17 cases, and gave a ratio of $126.86\frac{0}{0}$, as against $109.36\frac{0}{0}$ last year. The loss of service was 113 days, the daily average ratio of sick $2.23\frac{0}{0}$, and the average duration of treatment 6.64 days. The chief contributors were stemma, 3 cases, contusio, 4, and wounds of various sorts, 9.

JUNIATA.

This vessel went into commission in October of 1881, and sailed shortly after for the Asiatic station, stopping *en route* at Horta, Fayal.

During her term of service but 4 cases of zymotic disease occurred, the most important of which was 1 of enteric fever, which was still under treatment at the close of the year. The ratio of admissions was $97.56\frac{0}{0}$, and of the daily sick, $16.09\frac{0}{0}$, with a loss of service of 40 days.

Of constitutional diseases there were returned 2 cases of chronic rheu-

matism, and 1 of secondary syphilis, making a ratio of $73.17\frac{0}{0}$. All were invalided to hospital.

The nervous and respiratory classes were each represented by 1 case, and there were no diseases of the digestive system. Of the genito-urinary affections there were 2 cases returned, one of prostatitis, and 1 of varicocele, causing a ratio of $48.78\frac{0}{0}$, and a total loss of service of 29 days.

Seven cases of diseases of the integumentary system were reported, a ratio of $170.73\frac{0}{0}$, giving a ratio of $19.02\frac{0}{0}$. The loss of service was 47 days, and the average duration of treatment was 6.71 days.

The class of diseases from violence was most numerously represented on this ship, 11 cases being returned, giving a ratio of $268.29\frac{0}{0}$, and a loss of service of 70 days. There was a large daily average of $28.29\frac{0}{0}$, and the average duration of treatment was 6.36 days. One case of lacerated wound was invalided to hospital.

MONOCACY.

This vessel spent the early part of the year in various parts of Japan. Later she went to Corea, and was some months engaged in cruising along the coast of that division and China, returning toward the close of the year to Japan. During the year her service at sea was 36 days, and she was in port 329 days.

The zymotic class of diseases were represented in this ship by a total of 11 cases, and a ratio of $72.86\frac{0}{0}$, as against $83.86\frac{0}{0}$ last year. The cases were, chiefly, 4 of simple continued fever, 2 of intermittent, and 3 of remittent fevers; 1 of the latter cases was invalided to hospital. The loss of service was 85 days, and the average daily ratio was $1.52\frac{0}{0}$, while the average duration of treatment was 7.72 days.

The constitutional diseases numbered 18 cases, or $119.20\frac{0}{0}$, as against $109.66\frac{0}{0}$ last year. The cases were entirely of rheumatism and syphilis, 6 of the former and 13 of the latter. The loss of service was 192 days, and the average daily ratio $3.44\frac{0}{0}$. Three cases, or $19.86\frac{0}{0}$, were invalided to hospital, and the average duration of treatment was 8.53 days.

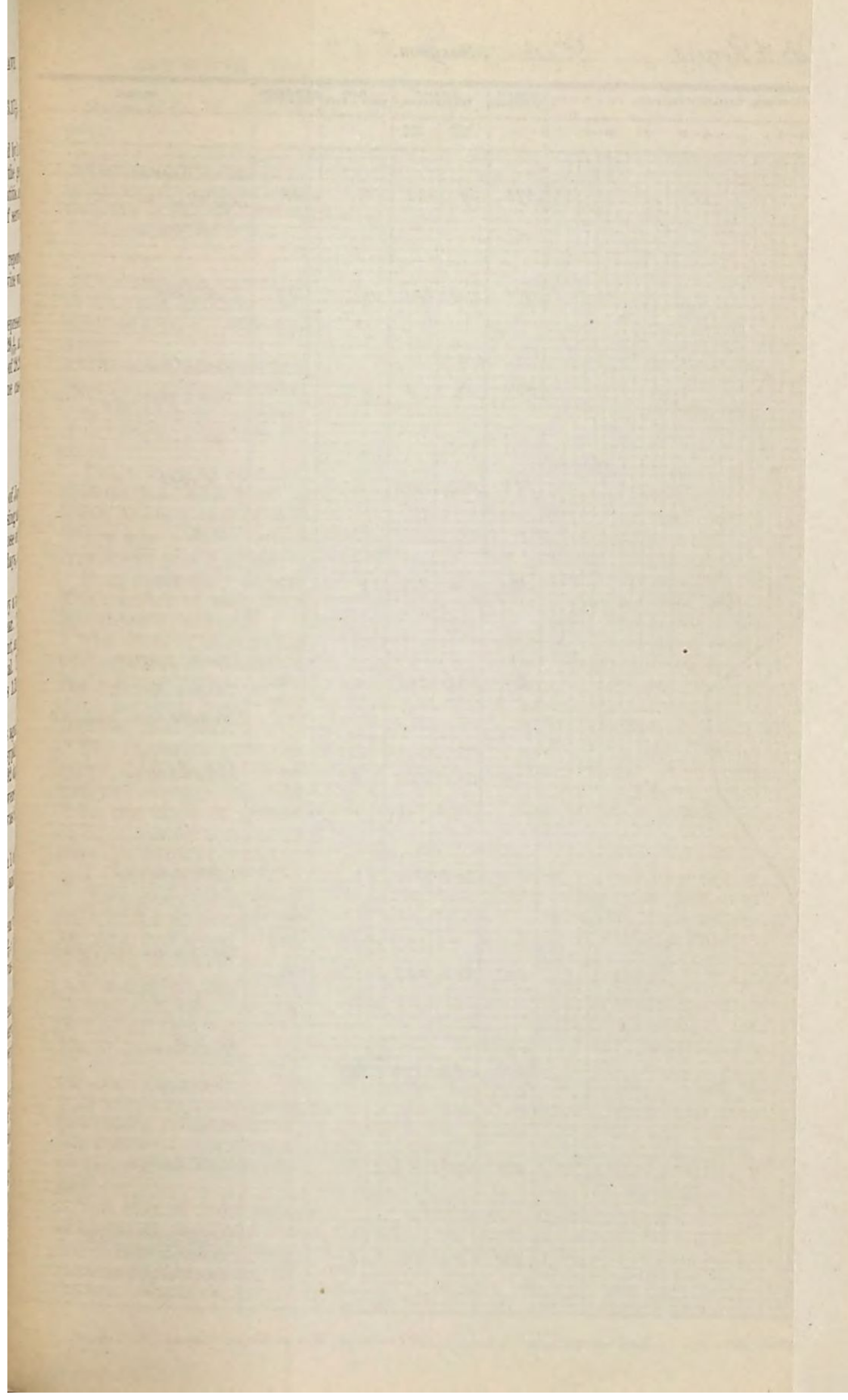
Diseases of the respiratory system were 7 in number, of which 1 case of phthisis was invalided. The ratio of admissions was $46.55\frac{0}{0}$, and of the daily sick $.46\frac{0}{0}$. The loss of service was 25 days.

The ratio given by 13 cases of diseases of the digestive system was $86.09\frac{0}{0}$, a large diminution from last year, when it was $199.98\frac{0}{0}$; the daily average sick rate was $1.25\frac{0}{0}$. The number of sick days was 29, or 5.46 for each case.

Ten cases of orchitis were the only cases returned under the head of genito-urinary affections, giving a ratio of $33.11\frac{0}{0}$, and a loss of service of 43 days. The daily average ratio was $.72\frac{0}{0}$, and the average period of treatment 8.6 days.

The integumentary diseases were only 4 in number, 2 of abscessus and 2 of furunculus, a ratio of $26.49\frac{0}{0}$, a large reduction from $103.21\frac{0}{0}$ of last year. The number of sick days was 61, and the average daily ratio of sick was $1.05\frac{0}{0}$.

There were 12 cases of sickness from injuries, making a ratio of $79.47\frac{0}{0}$, the chief factors being 4 of stremma and 5 of vulnus laceratum, 2 of the latter being invalided to hospital. The number of sick days was 177, and the daily ratio of patients $3.17\frac{0}{0}$, while the average duration of treatment was 14.58 days.



U. S. S. *Richmond**B. F. Rogers**P. A.*, Surgeon.*

MONTH.	CARBON DIOXIDE—PARTS PER 1,000.			RELATIVE HUMIDITY—PARTS PER 100.			PERCENTAGE OF SICK, (EXCLUDING INJURIES.)				AVERAGE STRENGTH.	AVERAGE TEMPERATURE.		DAYS SNOW or RAIN.	DAYS BERTH-DECK WET.	STATION.
	0-1	1-2	2-3	40-60	60-80	80-100	0-2	2-4	4-6	6-8		Berth-deck.	Spar-deck.			
1882																
January	No observations										393	29.3	27.8	5	29	Apia, Samoa to 8th Pago Pago, do 11 to 17 At sea
February		do.									381	24.8	22.1	14	22	At sea
March		do.									350	+	9.4	4	18	Yokohama to 22 Kobe from 27th
April		do.									322	19.6	16.4	8	11	Kobe
May											324	20.3	21.	9	16	Kobe
June											311	23.2	21.8	12	16	Kobe to 9th Kagasaki 12 to 19 Yokohama from 26
July											316	26.1	23.4	2	7	Yokohama
August											317	26.5	26.4	7	5	Yokohama
September											315	23.3	22.7	7	6	Yokohama to 3rd from 8 Bay of Yeddo 4 to 7
October											310	19.3	17.7	10	7	Yokohama to 21 Yokozuka from 21
November											310	+	17.8	4	5	Yokohama
December											310	+	18.6	3	6	Yokohama to 6 Kobe 8 to 13 Coasting 13 to 18 Kagasaki 18 to 25

* A. S. Oberly, Surgeon, from March

+ Steam heat

§ Berth deck covered with matting which is taken up two or three times a week

Surgeon G. W. Woods makes the following note in his sanitary report:

I would call particular attention to the ventilation of the berth-deck, which is vastly superior to most naval vessels of the class of the Juniata. This perfection is due to an additional ventilator of large size placed near the after bulk-head, and thus with the ordinary forward ventilators and hatchways a current of air is established the entire length of the deck.

PALOS.

This steamer was at the various ports of Japan during three-fourths of the year, and the last quarter was chiefly spent in cruising along the coast of China. She was employed at sea 30 days and was in port 330 days.

The cases of zymotic disease occurring on this vessel were 3 each of remittent and intermittent fevers and 1 of vaccina. The ratio of cases was $142.85\frac{0}{0}$, as against $122.80\frac{0}{0}$ last year, while the ratio of daily sick was $1.02\frac{0}{0}$. Nineteen sick days gave an average loss of service of 2.71 days.

There were 13 cases of constitutional affections, 3 of adynamia, 2 of rheumatism, and 8 of syphilis, giving a ratio of $265.30\frac{0}{0}$ against the small one last year of $52.63\frac{0}{0}$, and there was a loss of service of 111 days. There was a daily ratio of sick of $6.12\frac{0}{0}$, and the average duration of treatment was 8.53 days.

Four cases only of nervous diseases were returned, a ratio of $81.63\frac{0}{0}$. The number of sick days was 18, and 1 case of neuralgia ($20.40\frac{0}{0}$) was invalided to hospital.

The class of respiratory diseases yielded 8 cases, of which 1 case of phthisis was invalided to hospital. The number of sick daily was in the ratio of $1.22\frac{0}{0}$, and there was a loss of service of 25 days, or 3.12 days for each case. The ratio of admissions was $163.26\frac{0}{0}$, as against $105.26\frac{0}{0}$ last year.

The digestive gave the same number of cases and ratio as the respiratory, and the loss of service was 29 days. There was no invaliding, and the average duration of treatment was 3.62 days.

In the class of genito-urinary affections were single cases of chan-croides, gonorrhœa, and orchitis, yielding a ratio of $61.22\frac{0}{0}$, and a daily average ratio of $2.45\frac{0}{0}$. The loss of service was 46 days. The ratio last year was $122.80\frac{0}{0}$.

The cases of skin diseases reported were 4 of furunculus, 2 of paronychia, and 1 of pemphigus; 7 in all, with a ratio of $142.85\frac{0}{0}$, as against $122.80\frac{0}{0}$ last year. The number of sick days was 39, and the average duration of treatment 5.57 days.

The injuries reported were 3 cases of contusion and 2 of vulnus contusum, and the ratio was $102.04\frac{0}{0}$, as against $157.89\frac{0}{0}$ last year. The loss of service was only 16 days, and there was no invaliding.

RICHMOND.

During the early part of the year this ship was engaged in making the return passage from Panama, where she had exchanged crews, to her station. Arriving at Yokohama in March, she spent the remainder of the year in Japanese waters, having been at sea 67 days and in port 297.

The stay of this vessel at Panama was productive of considerable malarial disease, and accounts for the large ratio of zymotic diseases, which was $130.69\frac{0}{0}$, as given by 43 cases. The attending loss of service was 348 days, and the number daily sick was in the ratio of $2.88\frac{0}{0}$.

The cases were 12 of intermittent fever and 30 of remittent, 1 of the latter being invalided to hospital. The average duration of treatment was 8.09 days.

The constitutional diseases contributed 53 cases, a ratio of $161.09\frac{0}{0}$, a large increase over that of last year, which was $69.52\frac{0}{0}$. They were, chiefly, 11 cases of lumbago, 23 of rheumatism, and 18 of syphilis. Six cases, or $18.23\frac{0}{0}$, were invalided to hospital. The number of daily sick was in the ratio of $6.71\frac{0}{0}$, and the loss of service was 806 days, or an average of 15.20 days for each case.

Fifteen cases made up the class of nervous affections, the ratio being $45.59\frac{0}{0}$, as against $40.65\frac{0}{0}$ last year. The ratio of daily sick was $1.42\frac{0}{0}$, and the loss of service 173 days, so that the average duration of treatment was 11.6 days. Three cases, or $9.09\frac{0}{0}$ were invalided to hospital.

The group of diseases of the respiratory system was represented by 19 cases, a ratio of $57.75\frac{0}{0}$, as against $78.59\frac{0}{0}$ last year. One case of acute bronchitis and 1 of phthisis were invalided to hospital. The loss of time amounted to 242 days, and the daily sick gave a ratio of $2.0\frac{0}{0}$. The average period of treatment was 12.73 days.

The returns comprised 64 cases of diseases of the digestive system, with a ratio of $194.52\frac{0}{0}$, and a daily sick rate equal to $2.88\frac{0}{0}$. The invalided were 2 cases of hernia with a ratio of $6.06\frac{0}{0}$, and the loss of service was 311 days, giving an average duration of 4.85 days to each case.

Disorders of the genito-urinary system were noted in 42 cases, contributing a ratio of $127.65\frac{0}{0}$, more than double that of last year, $67.7\frac{0}{0}$. The ratio of the daily sick was $5.50\frac{0}{0}$, and the total loss of service was 663 days, or 15.78 days for each case. One case of orchitis only was invalided.

There were 64 cases of integumentary diseases, giving the largest ratio of the squadron, $194.52\frac{0}{0}$, which is more than twice that of 1881, which was $86.62\frac{0}{0}$. The prevailing affections were furunculus, 30 cases; ulcer, 18; and abscessus, 7; the loss of service sustained was 536 days, and the daily average ratio of sick from these affections was $4.43\frac{0}{0}$. The average period of treatment was 837 days, and there was no invaliding.

Eighty cases of injury gave a ratio of $243.16\frac{0}{0}$, a considerable increase over that of last year, which was $151.76\frac{0}{0}$, and the resulting loss of service was 720 days. The number sick daily was in the ratio of $5.98\frac{0}{0}$, and the average duration of treatment was 9 days. One case of fracture and 1 of punctured wound were invalided.

SWATARA.

This vessel was employed during the first, second, and a portion of the third quarters of the year in cruising between various parts of China and Japan. In the latter part of October she sailed for the United States, arriving at Hampton Roads in December. During the year she was at sea 136 days, and in port 213 days.

In the zymotic class of diseases there were reported from this ship 16 cases, equally divided among febris intermittens and vaccina. The ratio of admissions was $81.21\frac{0}{0}$, and of the daily sick $1.11\frac{0}{0}$. Eighty days were lost, and the average duration of treatment was 5 days, no cases having been invalided.

The constitutional class yielded 28 cases, and a ratio of $142.13\frac{0}{0}$, as against $128.70\frac{0}{0}$ last year. These included 17 cases of rheumatism, 4 of syphilis, and 4 of lumbago. Four cases were invalided, the ratio being

20.30 $\frac{0}{0}$. The loss of service was 193 days, and the daily average rate of sick 2.79 $\frac{0}{0}$. The average period of treatment was 6.89 days.

The nervous affections included only 7 cases, 6 of cephalalgia and 1 of neuralgia, the ratio being 35.53 $\frac{0}{0}$, as against 26.51 $\frac{0}{0}$ last year. The loss of service was 16 days.

Twelve cases fell under diseases of the respiratory organs, a ratio of 60.91 $\frac{0}{0}$, as against 32.76 $\frac{0}{0}$ last year. Three cases, or 15.22 $\frac{0}{0}$, were invalided to hospital. The loss of service was 226 days, and the number sick daily was in the ratio of 3.24 $\frac{0}{0}$, while the average duration of treatment was 18.83 days. The cases invalided were 2 of phthisis and 1 of asthma.

The digestive system furnished 26 cases of sickness, and a ratio of 131.97 $\frac{0}{0}$, a considerable diminution from that of last year, 220.50 $\frac{0}{0}$. The loss of service was 26 days, and the daily average ratio of sick was 1.21 $\frac{0}{0}$. One case of chronic dysentery was invalided to hospital, and the average duration of treatment was 3.23 days.

The entries under the head of genito-urinary affections were 18, and the ratio was 91.37 $\frac{0}{0}$, as against 117.94 $\frac{0}{0}$ last year. The loss of service was 222 days, and the average ratio of sickness was 3.19 $\frac{0}{0}$. The cases included were 4 of chancroides, 2 of gonorrhœa, and 12 of orchitis, 1 of which was invalided to hospital. The average duration of treatment was 12.33 days.

The ratio contributed by 23 cases of skin diseases was 116.75 $\frac{0}{0}$, as against 128.20 last year. The prevailing affection was furunculus, of which there were 16 cases. The loss of service was 158 days, and the number of sick daily was in the ratio of 2.28 $\frac{0}{0}$. There was 1 case of invaliding, and the average duration of treatment was 6.86 days.

Thirty-seven cases of injury gave a ratio of 187.81 $\frac{0}{0}$, as against 241.01 $\frac{0}{0}$ in the preceding year. One case of contusion and 1 of vulnus punctum were invalided, a ratio of 10.14 $\frac{0}{0}$, and there was 1 death from punctured wound. The total loss of service was 293 days, and the number of daily sick was in the ratio of 4.21 $\frac{0}{0}$. The average duration of treatment was 7.91 days.

MEDICAL TOPOGRAPHY AND SANITARY REPORTS.

REPORT OF SURGEON G. W. WOODS,
U. S. S. JUNIATA.

Fayal is situated (Horta) in latitude $38^{\circ} 31' 45''$ north, longitude $28^{\circ} 38' 24''$ west, and is the best known of the Azorean group from having been for so many years the rendezvous of the American whaling fleet, which has been the means of establishing intimate commercial relations with New England. It is also the point at which ships from the Cape of Good Hope and South America touch on their return to Europe.

Horta, the principal port of Fayal, is considered the best harbor in the Azores; and it is an excellent refuge save during the southerly weather of winter, and especially during the prevalence of southeast winds, which render it then a very imperfect roadstead. During our stay the prevailing winds have been from the southward, and the ship was scarcely more comfortable than at sea. Most of the time we have been riding at two, and sometimes three, anchors. On many occasions we could not communicate with the shore, and on one occasion were compelled to put to sea. During this period the weather was the coolest of the year (58° F.), and the rain fell in repeated heavy showers.

Horta is beautifully located at the base of high wooded hills, and is a quaint old town of glaringly white-washed stone buildings, with many prominent churches and ecclesiastical edifices, constructed in the Byzantine style, the effect being singularly picturesque. The streets are well paved, and the roads admirably macadamized with volcanic rock. Along the shore is a sea-wall of great strength, extending for many miles, and parallel to this is a broad macadamized road, unsurpassed anywhere in the world. A breakwater, now in process of construction, already affords shelter in all weathers to a limited number of vessels, and, when completed, will render Horta a secure harbor at all seasons.

At the southern extremity of the harbor are Monte Queimado and Monte da Guia, great volcanic domes, and at the northern extremity is Espalamanca, an equally prominent headland. All are variegated layers of tufa, stratified parallel to the surface. Monte de Guia is deeply mined by the action of the sea forming extensive caverns, and fashioning the basaltic formations into the appearance of ancient ruins. On the slope towards the shore this headland forms the side of a submerged crater, the "Caldeira do Inferno." On the slopes of these promontories are cultivated fields divided into rectangular lots by hedges of cane, and along the coast road are luxurious country houses protected by high stone walls from the winter winds. These inclose pretty gardens, in which there is a tropical growth of palms, dragon-trees, cactus, and camellias.

The old geological idea prevailed for a long period, that the Azores were a prolongation of the Atlas Mountains, but later investigation has determined that they are a volcanic upheaval and continuous with the basaltic formation of Portugal. Their structure is exclusively com-

posed of volcanic rocks, separated by immense beds of tufa, conglomerate, and other products of eruption. There are vast strata of condensed lava and trachyte, which, flowing to the shore, have formed, through the action of the sea, a bristling, melancholy line of black, pointed rocks, encircling the island. Layers of pumice are found directly beneath the soil, which absorbs superficial moisture and prevents the necessity of any system of sewerage. Wells are sunk to the lower condensed strata, and a supply of good pure water is thus obtained everywhere. Many of these in the lower portions of the town are, however, brackish from a communication with the sea.

The disintegration of volcanic rock, and vegetable decomposition of centuries have formed a rich soil, which, under the influence of constant humidity, has produced a luxuriant growth of vegetation. There is no plant which will not thrive here, though some, as the *Palmaceae*, are generally unfruitful.

The earliest writer on the Azores is La Pere Fructuosa, about the end of the fifteenth century. He reports that the first voyagers found no quadrupeds, and the flora was as limited as the fauna. No reptiles were found, and, to this day, it has been impossible to acclimatize them, save in one or two instances, and only one bird, a variety of chaffinch, is supposed to have been indigenous to the island.

The lapse of more than two centuries has, however, produced a vast change. There are now plenty of fine cattle of a small size, but poor milkers, and forming superior beef. Sheep and goats thrive well. Rabbits abound, also the weasel, mouse, and both the black and gray rat. Of birds we find the wood-cock, several varieties of water fowl, the sparrow, black bird, robin red-breast, two varieties of chaffinch, and of migratory birds, the swallow, and a species of bullfinch.

Frogs imported in 1820 have so thriven and multiplied as to become a nuisance during the hot season, but toads have invariably died, though the moist conditions here constantly present seem suitable to their propagation. There are no serpents, as previously stated, and the only specimen of reptile is the small lizard, *Lacerta dugesii*, common also to Madeira.

The only fish are the gold-fish (*Cyprinus amatus*) not indigenous, found in abundance in the lakes occupying extinct volcanic craters, and one variety of eel. The sea, however, furnishes an abundance of superior food-fish, including the bonita, Spanish mackerel, tunny, chicharro, (*Caraux trachurus*), which appears in September in immense schools. The bonita is often so abundant as to be sold for two cents a pound, and is only eaten by the poor. The cray-fish is also, at certain seasons, caught in large numbers.

The terrestrial mollusca are not numerous, and include only sixty-nine species. The marine mollusca embrace fifty-two species, twenty-eight being small varieties of *Helix* and eight of *Sitirina*. The Octopus, Sepià, and Abalone abound in Azorean waters.

Of the Coleoptera fifty-nine species have been enumerated, eight only being peculiar to the group. Of Lepidoptera a few common varieties only have been described.

Of the Flora only forty-eight plants are known to be indigenous to the island, including the *faya*, or native beach, which gives the name to Fayal. At present every known plant will thrive here, and the vast grounds of Consul Dabney are a veritable botanical garden. Here may be seen the choicest double-camellias forming lofty hedges of green leaves and rich colored blossoms, growing with even more luxuriance than in their native Japan. Roses of every variety, as trees, not shrubs,

and ever-blooming heliotropes, with sturdy trunks ten feet in height, African date-palms, grape-vines, fruit-trees of the temperate zone, and all the vegetable wonders of Australia.

Fayal is a favorite health resort, especially for the people of New England. It is particularly admirable for its equable temperature, and moderate summer heat. This will be seen from the following table, prepared by Hon. S. W. Dabney, consul of the United States at Fayal, from observations made in 1857, and which represents an average year:

Thermometer in open air on north side of house.

Months.	7 a. m.	2 p. m.	9 p. m.	Monthly mean.
1857.	°F.	°F.	°F.	°F.
January	57	59½	57	58
February	53	56	53½	54
March	56	59½	55½	57
April	58½	61½	56	59
May	60	62½	57	60
June	65½	68	61½	65
July	69½	73	67	70
August	70	74	68½	71
September	65	69½	64	66
October	61	64½	61	62
November	61	65	61	62
December	57	60	57½	58

Maximum observed temperature, 80°; minimum observed temperature, 44°.

The island is remarkably healthy, and scarcely any form of epidemic disease has ever seriously prevailed. Whooping-cough is an exception, this disease having frequently assumed an epidemic form, and proven very fatal to children.

Pulmonary consumption has of late years been quite fatal among the female population, who are compelled to lead sedentary lives, and to work at their avocations within ill-ventilated dwellings. The father of the present Consul Dabney, who filled the same office for many years, stated that this disease was unknown until windows were introduced in Fayal, some fifty years since.

A mild form of intermittent is frequently met with, but continued fevers are very rare.

Dyspepsia is a very common affection, and it is attributed to the extensive consumption of a favorite dish by the middle classes, a soup composed of stock, cabbage, and sour bread, and known as "sopas."

Syphilis is especially common, and liberty at these islands is generally followed by much disease. During the Franco-Prussian war a German man of-war remained at Fayal for some time, and so many cases of venereal disease followed liberty the efficiency of the ship was seriously impaired, one-half of the ship's company being under treatment. This was, however, exceptional. Fayal is subject to the Portuguese law requiring all prostitutes to be periodically examined and provided with certificates of their freedom from disease. But this law cannot be enforced at Fayal, as the municipality have no means of caring for those who might be denounced as unclean.

The only hospital is the "Hospital da Misericordia, e asilo da Merdici-dada da Horta." It occupies spacious quarters in the cloisters of the old Franciscan convent, and is a very creditable institution. The earthquake of May 3, 1882, injured the building seriously, and in consequence a movement is on foot to erect a structure better suited to the purposes of a modern hospital. Bazaars have been held in Horta to

raise funds for the purpose, and from Portugal assistance has been promised.

The present hospital embraces four wards, two male and two female, one female ward being devoted to prostitutes. These wards, accommodating eighty patients, are formed by breaking down the old cell partitions, and are comfortable, well lighted, moderately well ventilated, and sufficiently well furnished. The furniture consists of neat iron bedsteads, straw mattresses, good blankets, and calico spreads. Small tables and chairs are placed at each bedside, and all meals are served in the wards. An elaborate ticket in a printed form hangs at the head of each bed, giving in one column minute information in regard to the patient, his family, and his clinical history, condition on entering the hospital, and diagnosis, the other column being left blank for daily clinical notes. The ration is liberal, and, as Fayal markets are remarkably cheap, everything the market affords is provided.

In connection with the hospital is a dispensary attended by the visiting physicians daily, at which, however, no medicine is dispensed save to the extremely indigent. Lack of funds renders this a necessity.

There is a series of nicely furnished rooms for paying patients, and these are frequently occupied by foreigners belonging to the commercial marine and officers of the Government service.

The hospital is unprovided with bath-rooms or proper water-closets. Where necessary baths are given in the wards in huge portable tubs, and under a similar necessity an excellent variety of close-stool is made use of. The kitchen was found neat and clean, and the food was well cooked and served. There is no lying-in ward, only complicated cases being brought to the hospital, and such an occurrence is very rare.

The institution is supported by donations and bequests, netting an average income of \$5,400. This is supplemented by paying patients, soldiers, and foreigners to the extent of \$1,500 additional. The official control of the institution is vested in a "board" duly elected by the religious congregations, which board selects its own president and officers. This organization generally embraces the principal medical men of the town, who practically control its deliberations.

TABLE I.—*Showing the force on each ship, the number admitted and discharged, the num*

Vessels.	Strength.	Strength corrected for time.	Admitted.					Total.
			From last year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	
Alert, third-rate, 541 tons, iron, screw; service, 209 days	160	93	6	60	60	9	.....	135
Ashuelot, third-rate, 786 tons, iron, paddle; service, 365 days	134	134	3	13	30	36	22	104
Juniata, third-rate, 828 tons, wood, screw; service, 60 days	254	41	...	.....	.....	.....	31	31
Monocacy, third-rate, 747 tons, iron, paddle; service, 365 days	151	151	2	31	14	15	20	82
Palos, fourth-rate, 306 tons, wood, screw; service, 365 days	49	49	1	8	16	19	15	59
Richmond, second-rate, 2,000 tons, wood, screw; service, 365 days	329	329	12	99	112	103	89	415
Swatara, third-rate, 910 tons, wood, screw; service, 349 days	207	197	3	59	47	52	27	188
Total	1,284	994	27	270	279	234	204	1,014

ber of days under treatment, and the average per thousand of force on the Asiatic Station.

Discharged.					Continued.	Number of sick days.	Average number of days under treatment.	Daily average number of sick.		Number admitted per thousand of strength.
Cured.	Invalided.		Died.	Total.				Absolute.	Per thousand of strength.	
	To hospital.	From the service.								
112	20	1	2	135	.....	1,511	11.19	7.22	77.62	1451.61
86	15	.....	1	102	2	1,049	10.08	2.87	21.41	776.11
20	7	....	.....	27	4	206	6.64	3.43	83.65	756.09
71	9	.....	.....	80	2	722	8.80	1.97	13.04	543.04
55	3	.....	.....	58	1	374	6.27	1.01	20.61	1204.08
382	19	.....	.....	401	14	4,191	10.09	11.48	34.89	1261.39
175	12	.....	1	188	.....	1,354	7.20	3.87	36.54	954.31
901	85	1	4	991	23	9,403	9.27	25.76	25.91	10201.12

TABLE II.—Showing the number of cases, the discharged, invalided and dead,

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
A.—GENERAL DISEASES.			
I.—ZYMOTIC DISEASES.			
Febricula.....	3	3.01	15
Febris continua simplex.....	13	13.07	104
Febris enterica.....	2	2.01	33
Febris intermittens.....	32	32.19	144
Febris remittens.....	37	37.22	311
Parotitis.....	2	2.01	8
Vaccina.....	10	10.06	62
Total.....	99	99.59	677
II.—CONSTITUTIONAL DISEASES.			
Adynamia.....	9	9.05	32
Anæmia.....	1	1	6
Hydrops.....	1	1	39
Lumbago.....	18	18.10	133
Rheumatismus acutus.....	18	18.10	365
Rheumatismus chronicus.....	43	43.25	570
Rheumatismus gonorrhœica.....	2	2.01	33
Syphilis primitiva.....	23	23.13	394
Syphilis consecutiva.....	40	40.24	541
Total.....	155	155.94	2,113
B.—LOCAL DISEASES.			
I.—DISEASES OF THE NERVOUS SYSTEM.			
Cephalalgia.....	16	16.09	44
Epilepsia.....	2	2.01	95
Mania.....	1	1	2
Nausea marina.....	3	3.01	11
Neuralgia.....	12	12.07	124
Paralysis.....	1	1	5
Pleurodynia.....	2	2.01	15
Vertigo.....	2	2.01	5
Total.....	39	39.23	301
II.—DISEASES OF THE EYE.			
Conjunctivitis.....	10	10.06	78
Iritis.....	2	2.01	16
Ophthalmia.....	1	1	1
Total.....	13	13.07	95
III.—DISEASES OF THE EAR.			
Otitis.....	2	2.01	13
Otorrhœa.....	1	1	4
Total.....	3	3.01	17
IV.—DISEASES OF THE TEETH.			
Odontalgia.....	3	3.01	8
V.—DISEASES OF THE CIRCULATORY SYSTEM.			
Aneurysma.....	1	1	1
Palpitatio.....	4	4.02	16
Phlebitis.....	1	1	2
Total.....	6	6.03	19

for each disease, and their ratio per thousand of force on the Asiatic Station.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.04	.04	5	3	3.01							
.28	.28	8	12	12.07							1
.09	.09	16.5									2
.39	.39	4.5	32	32.19							
.85	.85	8.4	35	35.21	2	2.01					
.02	.02	4	2	2.01							
.17	.17	6.2	10	10.06							
1.85	1.86	6.83	94	94.56	2	2.01					3
.08	.08	3.55	8	8.04	1	1					
.01	.01	6	1	1							
.10	.10	39	1	1							
.36	.36	7.38	17	17.10							1
1.00	1.00	20.27	16	16.09	2	2.01					
1.56	1.56	13.25	30	30.18	11	11.06					2
.09	.09	16.5			2	2.01					
1.07	1.07	17.13	20	20.12	2	2.01					1
1.48	1.48	13.52	31	31.18	8	8.04					1
5.78	5.81	13.63	124	124.74	26	26.15					5
.12	.12	2.75	16	16.09							
.26	.26	4.75			2	2.01					
		2			1	1					
.03	.03	3.66	3	3.01							
.33	.33	10.33	8	8.04	4	4.02					
.01	.01	5	1	1							
.04	.04	7.5	1	1	1	1					
.01	.01	2.5	2	2.01							
.82	.82	7.71	31	31.18	8	8.04					
.21	.21	7.80	10	10.06							
.04	.04	8	2	2.01							
		1			1	1					
.26	.26	7.30	12	12.07	1	1					
.03	.03	6.5	2	2.01							
.01	.01	4	1	1							
.04	.04	5.66	3	3.01							
.02	.02	2.66	2	2.01			1	1.006			
.04	.04	1	2	2.01	2	2.01			1	1	
		2	1	1							
.05	.05	3.16	3	3.01	2	2.01			1	1	

TABLE II.—Showing the number of cases, the discharged, invalided and dead, for each

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
VI.—DISEASES OF THE RESPIRATORY SYSTEM.			
Asthma.....	7	7.04	145
Bronchitis acuta.....	14	14.08	92
Bronchitis chronica.....	5	5.03	41
Catarrhus.....	18	18.10	80
Phthisis pneumonica, chronica.....	16	16.09	445
Pleuritis.....	2	2.01	36
Pneumonia.....	1	1	3
Total.....	63	63.38	842
VII.—DISEASES OF THE DIGESTIVE SYSTEM.			
Cholera morbus.....	7	7.04	20
Colica.....	25	25.15	87
Constipatio.....	2	2.01	5
Diarrhœa acuta.....	54	54.32	223
Dysentery acuta.....	5	5.03	30
Dysentery chronica.....	3	3.01	26
Dyspepsia.....	9	9.05	98
Fistula in ano.....	2	2.01	3
Gastritis.....	2	2.01	4
Hæmorrhoids.....	6	6.03	32
Hernia.....	4	4.02	105
Icterus.....	3	3.01	23
Pharyngitis.....	6	6.03	27
Stomatitis.....	1	1	6
Tonsillitis.....	30	30.18	115
Vermes.....	1	1	3
Total.....	160	160.96	807
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.			
Balanitis.....	1	1	54
Colica nephritica.....	2	2.01	20
Chancroides.....	12	12.07	217
Cystitis.....	1	1	3
Dysuria.....	1	1	3
Epididymitis.....	5	5.03	34
Gonorrhœa.....	35	35.21	418
Orchitis.....	31	31.18	394
Phymosis.....	1	1	23
Prostatitis.....	1	1	25
Urethræ strictura.....	7	7.04	75
Varicocele.....	2	2.01	14
Total.....	99	99.59	1,280
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.			
Arthritis.....	2	2.01	6
Synovitis.....	1	1	7
Total.....	3	3.01	13
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus.....	20	20.12	94
Anthrax.....	1	1	6
Ecthyma.....	1	1	4
Eczema.....	2	2.01	20
Erythema.....	1	1	20
Furunculus.....	60	60.36	360
Herpes.....	2	2.01	18
Onychia.....	1	1	9
Paronychia.....	11	11.06	121
Pemphigus.....	1	1	6
Ulcus.....	29	29.17	457
Urticaria.....	2	2.01	11
Total.....	131	131.78	1,126

disease, and their ratio per thousand of force, on the Asiatic Station—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From service.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
.39	.39	20.71	4	4.02	3	3.01					
.25	.25	6.57	13	13.07	1	1					
.11	.11	8.2	4	4.02							1
.21	.21	4.44	18	18.10							
1.21	1.21	27.81	2	2.01	14	14.08					
.09	.09	18	2	2.01							
		3			1	1					
2.30	2.33	13.36	43	43.25	19	19.11					1
.05	.05	2.85	7	7.04							
.23	.23	3.48	24	24.14							1
.01	.01	2.5	2	2.01							
.61	.61	4.12	52	52.31	1	1					1
.08	.08	6		5.03							
.07	.07	8.66	9		2	2.01			1	1	
.26	.26	10.88	1	90.5							
		1.05	2	1	1	1					
.01	.01	2	6	2.01							
.08	.08	5.33	9	6.03							
.28	.28	26.25	1	1	3	3.01					
.06	.06	7.66	3	3.01							
.07	.07	4.5	6	6.03							
.01	.01	6	1	1							
.31	.31	3.83	30	30.18							
		3	1	1							
2.21	2.22	5.04	150	150.90	7	7.04			1	1	2
.14	.14	54	1	1							
.05	.05	10	2	1.01							
.59	.59	18.08	10	10.06							2
		3	1	1							
		3	1	1							
.09	.09	6.8	5	5.03							
1.14	1.14	11.94	34	34.20							1
1.07	1.07	12.70	29	29.17	2	2.01					
.06	.06	23	1	1							
.06	.06	25	1	1							
.20	.20	10.71	5	5.03	1	1					1
.03	.03	7	1	1							1
3.50	3.52	12.92	91	91.54	3	3.01					5
.01	.01	3	2	2.01							
.01	.01	7	1	1							
.03	.03	4.33	3	3.01							
.25	.25	4.7	17	17.10	1	1					2
.01	.01	6	1	1							
.01	.01	4	1	1							
.05	.05	10	2	2.01							
.05	.05	20	1	1							
.98	.98	6	60	60.36							
.04	.04	9	1	1	1	1					
.02	.02	9	1	1							
.33	.33	11	9	9.05	2	2.01					
.01	.01	6	1	1							
1.25	1.25	15.75	28	28.16	1	1					
.03	.03	5.5	2	2.01							
3.08	3.09	8.59	124	124.74	5	5.03					2

TABLE II.—*Showing the number of cases, the discharged, invalided and dead, for*

Diseases and injuries.	Cases.		Number of sick days.
	Number.	% of force.	
B.—LOCAL DISEASES—Continued.			
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis	25	25.15	483
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Condyloma	1	1	12
Cystis	1	1	7
Fibroma.....	1	1	12
Total	3	3.01	31
C.—POISONS.			
Alcoholismus	32	22.19	97
Delirium tremens	1	1	2
Ebriositas	3	3.01	6
Total	36	36.21	105
D.—VIOLENT DISEASES AND DEATHS.			
Abrasio.....	10	10.06	84
Ambustio.....	5	5.03	54
Concussio spinalis	1	1	1
Congelatio	2	2.01	8
Contusio.....	56	56.33	420
Fractura.....	4	4.02	100
Luxatio.....	3	3.01	39
Stemma	35	35.21	207
Vulnus contusum.....	24	24.14	182
Vulnus incisum.....	19	19.11	155
Vulnus laceratum	14	14.08	151
Vulnus punctum	3	3.01	86
Total	176	177.06	1,486
Grand total	1,014	1,020.12	9,403

each disease, and their ratio per thousand of force on the Asiatic Station—Continued.

Average number of sick daily.		Average number of days under treatment.	Discharged to duty.		Invalided.				Died.		Continued.
Absolute.	% of force.		Number.	% of force.	To hospital.		From serv-ice.		Number.	% of force.	
					Number.	% of force.	Number.	% of force.			
1. 32	1. 32	19. 32	19	19. 11	4	4. 02	.....	.....	.....	.....	2
. 03	. 03	12	1	1	.....	.....	.....	.....	.....	.....	.....
. 01	. 01	7	1	1	.....	.....	.....	.....	.....	.....	.....
. 03	. 03	12	1	1	.....	.....	.....	.....	.....	.....	.....
. 08	. 08	10. 33	3	3. 01	.....	.....	.....	.....	.....	.....	.....
. 26	. 26	3. 03	32	32. 19	.....	.....	.....	.....	.....	.....	.....
. 01	. 01	2	3	3. 01	1	1	.....	.....	.....	.....	.....
. 28	. 28	2. 91	35	35. 21	1	1	.....	.....	.....	.....	.....
. 23	. 23	8. 40	10	10. 06	.....	.....	.....	.....	.....	.....	.....
. 14	. 14	10. 61	5	5. 03	.....	.....	.....	.....	.....	.....	.....
. 02	. 02	4	2	2. 01	.....	.....	.....	.....	1	1	.....
1. 15	1. 15	7. 5	53	53. 31	2	2. 01	.....	.....	.....	.....	1
. 27	. 27	25	3	3. 01	1	1	.....	.....	.....	.....	.....
. 10	. 10	13	3	3. 01	.....	.....	.....	.....	.....	.....	.....
. 56	. 56	5. 91	34	34. 20	.....	.....	.....	.....	.....	.....	1
. 49	. 49	7. 58	24	24. 14	.....	.....	.....	.....	.....	.....	.....
. 42	. 42	8. 15	18	18. 10	1	1	.....	.....	.....	.....	.....
. 41	. 41	10. 78	11	11. 06	2	2. 01	.....	.....	.....	.....	1
. 23	. 23	28. 66	1	1. 006	1	1	.....	.....	1	1	.....
4. 07	4. 09	8. 44	164	164. 98	7	7. 04	.....	.....	2	2. 01	3
25. 76	25. 91	9. 27	901	909. 65	85	85. 51	1	1	4	4. 02	23

TABLE III.—Showing the number of cases, the invalided

Vessels or stations	Alert.				Ashuelot.				Juniata.			
	Invalided.				Invalid- ed.				Invalid- ed.			
Diseases and injuries.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.
A.—GENERAL DISEASES.												
I.—ZYMOTIC DISEASES.												
Febricula	2								1			
Febris continua simplex	8								1			
Febris enterica					1				1			
Febris intermittens	1				5				1			
Febris remittens					1							
Parotitis												
Vaccina												
Total	11				7				4			
Ratio per thousand	118.27				52.23				97.56			
Number of sick days	65				40				40			
Average number sick daily	.31				.10				.66			
Av. number sick daily per thousand ..	3.33				.74				16.09			
Average duration of treatment	5.90				5.71				10			
II.—CONSTITUTIONAL DISEASES.												
Adynamia	4											
Anæmia												
Hydrops												
Lumbago	2				1							
Rheumatismus acutus	1				2							
Rheumatismus chronicus	5	3			3	2			2	2		
Rheumatismus gonorrhœicus	2	2										
Syphilis primitiva	7											
Syphilis consecutiva	6	3			7				1	1		
Total	27	8			13	2			3	3		
Ratio per thousand	290.32	86.02			97.01	14.92			73.17	73.17		
Number of sick days	580				227				4			
Average number sick daily	2.77				.62				.06			
Av. number sick daily per thousand ..	29.78				4.62				1.46			
Average duration of treatment	21.48				17.46				1.33			
B.—LOCAL DISEASES.												
I.—DISEASES OF THE NERVOUS SYSTEM.												
Cephalalgia	1				3							
Epilepsia					1	1						
Mania												
Nausea marina	1				1							
Neuralgia					4	2						
Paralysis									1			
Pleurodynia					1	1						
Vertigo												
Total	2				10	4			1			
Ratio per thousand	21.50				74.62	29.85			24.39			
Number of sick days	5				84				5			
Average number sick daily	.02				.23				.08			
Av. number sick daily per thousand ..	.20				1.71				1.95			
Average duration of treatment	2.5				8.4				5			

and dead, for each disease, on the Asiatic Station.

Monocacy.				Palos.				Richmond.				Swatara.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
4															
2				3				12				8			
3	1			3				30	1						
1								1							
1				1								8			
11	1			7				43	1			16			
72.86	6.62			142.85				130.69	3.03			81.21			
85				19				348				80			
.23				.05				.95				.22			
1.52				1.02				2.88				1.11			
7.72				2.71				8.09				5.			
				3								2	1		
												1			
								1							
								11				4			
3								11	2			1			
3				2				12	3			16	1		
5	1			3				7	1			1			
7	2			5				11				3	2		
18	3			13				53	6			28	4		
119.20	19.86			265.30				161.09	18.23			142.13	20.30		
192				111				806				193			
.52				.30				2.21				.55			
3.44				6.12				6.71				2.79			
10.66				8.53				15.20				6.89			
				1				5				6			
								1	1						
								1	1						
								1							
				3	1			4	1			1			
								1							
								2							
				4	1			15	3			7			
				81.63	20.40			45.59	9.10			35.53			
				18				173				16			
				.04				.47				.04			
				.80				1.42				.20			
				4.5				11.6				2.28			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alert.				Ashuelot.				Juniata.			
	Invalided.				Invalid- ed.				Invalid- ed.			
Diseases and injuries.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.	Cases.	To hospital.	From service.	Dead.
B.—LOCAL DISEASES—Continued.												
II.—DISEASES OF THE EYE.												
Conjunctivitis.....	1											
Iritis.....												
Ophthalmia												
Total.....	1											
Ratio per thousand.....	10.75											
Number of sick days.....	2											
Average number sick daily.....												
Av. number sick daily per thousand...												
Average duration of treatment.....	2											
III.—DISEASES OF THE EAR.												
Otitis.....												
Otorrhœa.....									1			
Total.....									1			
Ratio per thousand.....									24.39			
Number of sick days.....									4			
Average number sick daily.....									.06			
Av. number sick daily per thousand ..									1.46			
Av. duration of treatment.....									4			
IV.—DISEASES OF THE TEETH.												
Odontalgia	1		1									
Ratio per thousand.....	10.75		10.75									
Number of sick days	1											
Average number sick daily.....												
Av. number sick daily per thousand ..												
Average duration of treatment.....	1											
V.—DISEASES OF THE CIRCULATORY SYSTEM.												
Aneurysma					1			1				
Palpitatio					1				1	1		
Phlebitis												
Total.....					2			1	1	1		
Ratio per thousand.....					14.92			7.46	24.39	24.39		
Number of sick days					10				3			
Average number sick daily.....					.02				.05			
Av. number sick daily per thousand ..					.14				1.21			
Average duration of treatment.....					5				3			

dead, for each disease, on the Asiatic Station—Continued.

Monocacy.				Palos.				Richmond.				Swatara.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
2								8				1			
								1	1						
2								9	1			1			
13.24								27.35	3.03			5.07			
16								75				2			
.04								.20							
.26								.60							
8								8.33				2			
								2							
								2							
								6.06							
								13							
								.03							
								.09							
								6.5							
								2							
								6.06							
								7							
								.01							
								.03							
								3.5							
2	1														
								1							
2	1							1							
12.24	6.62							3.03							
4								2							
.01															
.06															
2								2							

dead, for each disease, on the Asiatic Station—Continued.

Monocacy.				Palos.				Richmond.				Swatara.			
Cases	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....								2	.....	.....	.....	2	1	.....	.....
.....				1	.....	.....	.....	9	1	.....	.....	2	.....	.....	.....
.....								1	.....	.....	.....	4	.....	.....	.....
6				6	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....
1	1	.....	.....	1	1	.....	.....	2	1	.....	.....	3	2	.....	.....
.....								1	.....	.....	.....	1	.....	.....	.....
7	1	.....	.....	8	1	.....	.....	19	2	.....	.....	12	3	.....	.....
46.35	6.62	.....	.....	163.26	20.40	.....	.....	57.75	6.06	.....	.....	60.91	15.22	.....	.....
25				25	.....	.....	.....	242	.....	.....	.....	226	.....	.....	.....
.07				06	.....	.....	.....	.66	.....	.....	.....	.64	.....	.....	.....
.46				1.22	.....	.....	.....	2.	.....	.....	.....	3.24	.....	.....	.....
3.57				3.12	.....	.....	.....	12.73	.....	.....	.....	18.83	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....								14	.....	.....	.....	3	.....	.....	.....
1				1	.....	.....	.....	27	.....	.....	.....	9	.....	.....	.....
3				3	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
.....								3	.....	.....	.....	1	1	.....	.....
.....								2	.....	.....	.....	.....	.....	.....	.....
1								1	.....	.....	.....	2	.....	.....	.....
1								2	2	.....	.....	.....	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....								3	.....	.....	.....	.....	.....	.....	.....
7				3	.....	.....	.....	8	.....	.....	.....	11	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13				8	.....	.....	.....	64	2	.....	.....	26	1	.....	.....
86.09				163.26	.....	.....	.....	194.52	6.06	.....	.....	131.97	5.07	.....	.....
71				29	.....	.....	.....	311	.....	.....	.....	84	.....	.....	.....
.19				.07	.....	.....	.....	.85	.....	.....	.....	.24	.....	.....	.....
1.25				1.42	.....	.....	.....	2.58	.....	.....	.....	1.21	.....	.....	.....
5.46				3.62	.....	.....	.....	4.85	.....	.....	.....	3.23	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....								2	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	7	.....	.....	.....	4	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....															
.....				1	.....	.....	.....	21	.....	.....	.....	2	.....	.....	.....
5				1	.....	.....	.....	8	1	.....	.....	12	1	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alert.				Ashuelot.				Juniata.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.												
VIII.—DISEASES OF THE GENITO- URINARY SYSTEM—Continued.												
Prostatitis									1			
Urethræ strictura	4				2	1			1			
Varicocele												
Total	15				14	1			2			
Ratio per thousand	161.29				104.48	7.46			48.78			
Number of sick days	166				111				29			
Average number sick daily	.79				.30				.48			
Av. number sick daily per thousand ...	8.49				2.23				11.70			
Average duration of treatment	11.06				7.92				14.5			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.												
Arthritis												
Synovitis	1											
Total	1											
Ratio per thousand	10.75											
Number of sick days	7											
Average number sick daily	.03											
Av. number sick daily per thousand ...	.32											
Average duration of treatment	7											
X.—DISEASES OF THE INTEGUMENT- ARY SYSTEM.												
Abscessus	3				2				4			
Anthrax												
Ecthyma					1							
Eczema												
Erythema												
Furunculus	7								1			
Herpes									1	1		
Onychia	1											
Paronychia	1	1			2				1	1		
Pemphigus												
Ulcus	3				5	1						
Urticaria					1							
Total	15	1			11	1			7	2		
Ratio per thousand	161.29	10.75			82.08	7.46			170.73	48.78		
Number of sick days	127				158				47			
Average number sick daily	.60				.43				.78			
Av. number sick daily per thousand ...	6.45				3.20				19.02			
Average duration of treatment	8.46				14.36				6.71			

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alert.				Ashuelot.				Juniata.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalid- ed.		Dead.	Cases.	Invalid- ed.		Dead.
		To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.												
XI.—DISEASES OF THE ABSORBENT SYSTEM.												
Adenitis	3	1	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
Total.....	3	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
Ratio per thousand.....	32.25	10.75	.....	.....	22.39	.....	.....	.....	.....	.....	.....	.....
Number of sick days	46	.....	.....	.....	49	.....	.....	.....	.....	.....	.....	.....
Average number sick daily.....	22	.....	.....	.....	.13	.....	.....	.....	.....	.....	.....	.....
Av. number sick daily per thousand...	2.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	15.33	.....	.....	.....	16.33	.....	.....	.....	.....	.....	.....	.....
XII.—NON-MALIGNANT TUMORS AND CYSTS.												
Condyloma.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Cystis	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fibroma.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Ratio per thousand.....	21.50	.....	.....	.....	7.46	.....	.....	.....	.....	.....	.....	.....
Number of sick days	19	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....
Average number sick daily	.09	.....	.....	.....	.03	.....	.....	.....	.....	.....	.....	.....
Av. number sick daily per thousand...	.96	.....	.....	.....	.22	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	9.5	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....
C.—POISONS.												
Alcoholismus	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
Delirium tremens .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ebriositas.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
Ratio per thousand.....	21.50	.....	.....	.....	14.92	.....	.....	.....	.....	.....	.....	.....
Number of sick days.....	5	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....
Average number sick daily	.02	.....	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....
Av. number sick daily per thousand ..	.20	.....	.....	.....	.07	.....	.....	.....	.....	.....	.....	.....
Average duration of treatment.....	2.5	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.												
Abrasio .....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Ambustio.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Concussio spinalis	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Congelatio.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Contusio	8	1	.....	.....	4	.....	.....	.....	5	.....	.....	.....
Fractura	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Luxatio.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stremma.....	1	.....	.....	.....	3	.....	.....	.....	1	.....	.....	.....

TABLE III.—Showing the number of cases, the invalided and

Vessels or stations	Alert.			Ashuelot.			Juniata.		
Diseases and injuries.	Cases.	Invalided.		Cases.	Invalid- ed.		Cases.	Invalid- ed.	
		To hospital.	From service.		To hospital.	From service.		To hospital.	From service.
			Dead.			Dead.			Dead.
D.—VIOLENT DISEASES AND DEATHS—Continued.									
Vulnus contusum	1	.....	.....	2	.....	.....	.....	.....	.....
Vulnus incisum	1	.....	.....	4	.....	.....	1	.....	.....
Vulnus laceratum .....	.....	.....	.....	3	.....	.....	2	1	.....
Vulnus punctum .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	14	1	1	17	.....	.....	11	1	.....
Ratio per thousand	150. 54	10. 75	10. 75	126. 86	.....	.....	268. 29	24. 39	.....
Number of sick days	97	.....	.....	113	.....	.....	70	.....	.....
Average number sick daily	. 46	.....	.....	. 30	.....	.....	1. 16	.....	.....
Av. number sick daily per thousand ...	4. 94	.....	.....	2. 23	.....	.....	28. 29	.....	.....
Average duration of treatment	6. 92	.....	.....	6. 64	.....	.....	6. 36	.....	.....
Grand total	135	20	1	104	15	1	31	7	.....
Ratio per thousand	1, 451. 61	215. 05	10. 75	21. 50	776. 11	111. 94	7. 46	756. 09	170. 73
Number of sick days	1, 511	.....	.....	1, 049	.....	.....	206	.....	.....
Average number sick daily	7. 22	.....	.....	2. 87	.....	.....	3. 43	.....	.....
Av. number sick daily per thousand ...	77. 62	.....	.....	21. 41	.....	.....	83. 65	.....	.....
Average duration of treatment	11. 19	.....	.....	10. 08	.....	.....	6. 64	.....	.....

dead, for each disease, on the Asiatic Station—Continued.

Monocacy.				Palos.				Richmond.				Swatara.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	.....	.....	.....	2	.....	.....	.....	6	.....	.....	.....	12	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	1	.....	.....	.....
4	2	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	3	1	.....	1
.....															
12	2	.....	.....	5	.....	.....	.....	80	1	.....	.....	37	2	.....	1
79.47	13.24	.....	.....	102.04	.....	.....	.....	243.16	3.03	.....	.....	187.81	10.14	.....	5.07
177	.....	.....	.....	16	.....	.....	.....	720	.....	.....	.....	293	.....	.....	.....
.48	.....	.....	.....	.04	.....	.....	.....	1.97	.....	.....	.....	.83	.....	.....	.....
3.17	.....	.....	.....	.80	.....	.....	.....	5.98	.....	.....	.....	4.21	.....	.....	.....
14.58	.....	.....	.....	3.2	.....	.....	.....	9	.....	.....	.....	7.91	.....	.....	.....
82	9	.....	.....	59	3	.....	.....	415	19	.....	.....	188	12	.....	1
543.04	59.60	.....	.....	1,204.08	61.22	.....	.....	1,261.39	57.75	.....	.....	954.31	60.91	.....	5.07
722	.....	.....	.....	370	.....	.....	.....	4,191	.....	.....	.....	1,354	.....	.....	.....
1.97	.....	.....	.....	1.01	.....	.....	.....	11.48	.....	.....	.....	3.87	.....	.....	.....
13.04	.....	.....	.....	20.61	.....	.....	.....	34.89	.....	.....	.....	36.54	.....	.....	.....
8.80	.....	.....	.....	6.27	.....	.....	.....	10.09	.....	.....	.....	7.20	.....	.....	.....

TABLE IV.—Showing the number of cases, the invalided and

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 375.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Febricula	2	5.33						
Febris continua simplex	4	10.66						
Febris enterica	1	2.66						
Febris intermittens	11	29.33						
Febris remittens	10	26.66	2	5.33				
Parotitis	1	2.66						
Vaccina	4	10.66						
Total	33	88	2	5.33				
II.—CONSTITUTIONAL DISEASES.								
Adynamia	1	2.66						
Anæmia								
Hydrops								
Lumbago	2	5.33						
Rheumatismus acutus	3	8						
Rheumatismus chronicus	8	21.33	2	5.33				
Rheumatismus gonorrhoeicus								
Syphilis primitiva	15	40	1	2.66				
Syphilis consecutiva	14	37.33	2	5.33				
Total	43	114.66	5	13.33				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	6	16						
Epilepsia								
Mania								
Nausea marina	1	2.66						
Neuralgia	1	2.66						
Paralysis								
Pleurodynia	1	2.66						
Vertigo								
Total	9	24						
II.—DISEASES OF THE EYE.								
Conjunctivitis	8	21.33						
Iritis	1	2.66						
Ophthalmia	1	2.66	1	2.66				
Total	10	26.66	1	2.66				
III.—DISEASES OF THE EAR.								
Otitis	2	5.33						
Otorrhœa								
Total	2	5.33						
IV.—DISEASES OF THE TEETH.								
Odontalgia	1	2.66			1	2.66		
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysm								
Palpitatio	3	8	2	5.33				
Phlebitis								
Total	3	8	2	5.33				

he dead, in decennial periods, with the ratios per thousand.

BETWEEN 25 AND 35 YEARS. (Mean force, 433.)								BETWEEN 35 AND 45 YEARS. (Mean force, 146.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
1	2.30														
7	16.16							2	13.69						
3															
13	30.02							6	41.09						
23	53.11							1	6.84						
1	2.30														
6	13.85														
51	117.78							9	61.64						
2	4.61	1	2.30					5	34.24						
1	2.30														
1	2.30														
8	18.47							3	20.54						
6	13.85	2	4.61					6	41.09						
12	27.71	2	4.61					10	68.49	2	13.69				
2	4.61	2	4.61												
7	16.16	1	2.31					1	6.84						
24	55.42	5	11.54					2	13.69	1	6.84				
63	145.49	13	30.02					27	184.93	3	20.54				
7	16.16							1	6.84						
2	4.61	2	4.61												
1	2.30							1	6.84	1	6.84				
5	11.54	2	4.61					1	6.84						
1	2.30														
								1	6.84						
16	36.95	4	9.23					4	27.39	1	6.84				
2	4.61														
1	2.30														
3	6.92														
1	2.30														
1	2.30														
2	4.61														
1	2.30							1	6.84					1	6.84
1	2.30														
2	4.61							1	6.84					1	6.84

TABLE IV.—Showing the number of cases, the invalided, and the

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 375.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma								
Bronchitis acuta	2	5.33						
Bronchitis chronica								
Catarrhus	7	18.66						
Phthisis pneumonica chronica	3	8	2	5.33				
Pleuritis	2	5.33						
Pneumonia								
Total	14	37.33	2	5.33				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus	3	8						
Colica	5	13.33						
Constipatio								
Diarrhœa acuta	18	48						
Dysentery acuta	1	2.66						
Dysentery chronica	1	2.66	1	2.66				
Dyspepsia								
Fistula in ano								
Gastritis								
Hæmorrhoids	1	2.66						
Hernia	2	5.33	2	5.33				
Icterus								
Pharyngitis	3	8						
Stomatitis								
Tonsillitis	18	48						
Vermes								
Total	52	138.66	3	8				
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Balanitis								
Colica nephritica								
Chancroides	6	16						
Cystitis								
Dysuria	1	2.66						
Epididymitis	4	10.66						
Gonorrhœa	20	53.33						
Orchitis	15	40						
Phymosis	1	2.66						
Prostatitis								
Urethræ strictura	2	5.33						
Varicocele	1	2.66						
Total	50	133.33						
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis	2	5.33						
Synovitis	1	2.66						
Total	3	8						
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus	10	26.66	1	2.66				
Anthrax								
Ecthyma	1	2.66						
Eczema								
Erythema								
Furunculus	24	64						
Herpes	2	5.33	1	2.66				
Onychia								
Paronychia	2	5.33	1	2.66				

TABLE IV.—*Showing the number of cases, the invalided and the*

Diseases and injuries.	BETWEEN 15 AND 25 YEARS. (Mean force, 375.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM—Continued.								
Pemphigus	1	2.66	.....	.....	.....	.....	.....	.....
Ulcus	10	26.66	.....	.....	.....	.....	.....	.....
Urticaria .....	.....	.....	.....	.....	.....	.....	.....	.....
Total	50	133.33	3	8	.....	.....	.....	.....
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	14	37.33	1	2.66	.....	.....	.....	.....
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Condyloma .....	.....	.....	.....	.....	.....	.....	.....	.....
Cystis .....	.....	.....	.....	.....	.....	.....	.....	.....
Fibroma .....	.....	.....	.....	.....	.....	.....	.....	.....
Total .....	.....	.....	.....	.....	.....	.....	.....	.....
C.—POISONS.								
Alcoholismus	1	2.66	.....	.....	.....	.....	.....	.....
Delirium tremens .....	.....	.....	.....	.....	.....	.....	.....	.....
Ebriositas	1	2.66	.....	.....	.....	.....	.....	.....
Total	2	5.33	.....	.....	.....	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	4	10.66	.....	.....	.....	.....	.....	.....
Ambustio	3	8	.....	.....	.....	.....	.....	.....
Concussio spinalis .....	.....	.....	.....	.....	.....	.....	.....	.....
Congelatio	1	2.66	.....	.....	.....	.....	.....	.....
Contusio	16	42.66	.....	.....	.....	.....	.....	.....
Fractura	2	5.33	1	2.66	.....	.....	.....	.....
Luxatio	1	2.66	.....	.....	.....	.....	.....	.....
Stemma	17	45.33	.....	.....	.....	.....	.....	.....
Vulnus contusum	6	16	.....	.....	.....	.....	.....	.....
Vulnus incisum	6	16	.....	.....	.....	.....	.....	.....
Vulnus laceratum	5	13.33	.....	.....	.....	.....	.....	.....
Vulnus punctum	3	8	1	2.66	.....	.....	1	2.66
Total	64	170.66	2	5.33	.....	.....	1	2.66
Grand total	350	933.33	21	56	1	2.66	1	2.66

dead, in decennial periods, with the ratio per thousand—Continued.

BETWEEN 25 AND 35 YEARS. (Mean force, 433.)								BETWEEN 35 AND 45 YEARS. (Mean force, 144.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
13	30.02	1	2.30					3	20.54						
2	4.61														
62	143.19	2	4.61					11	75.34						
8	18.47	2	4.61					2	13.69	1	6.84				
1	2.30														
1	2.30														
1	2.30														
3	6.92														
16	36.95							11	75.34						
1	2.30	1	2.30												
2	4.61														
19	43.87	1	2.30					11	75.34						
4	9.23							1	6.84						
2	4.61														
1	2.30					1	2.30								
1	2.30														
27	62.36	2	4.61					7	47.94						
1	2.30							1	6.84						
1	2.30							1	6.84						
12	27.71							4	27.39						
15	34.64							3	20.54						
6	13.85	1	2.30					3	20.54						
7	16.16	2	4.61												
77	177.83	5	11.54			1	2.30	20	136.98						
447	1032.33	45	103.92			1	2.30	135	924.65	8	54.79			2	13.69

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 30.)							
	Cases.		Invalidi				Died.	
	Number.	Ratio $\frac{\circ}{\circ\circ}$.	To hospital.		From serv- ice.		Number.	Ratio $\frac{\circ}{\circ\circ}$.
			No.	Ratio $\frac{\circ}{\circ\circ}$.	No.	Ratio $\frac{\circ}{\circ\circ}$.		
A. GENERAL DISEASES.								
I. ZYMOTIC DISEASES.								
Febricula								
Febris continua simplex								
Febris enterica	1	23.33						
Febris intermittens								
Febris remittens	2	66.66						
Parotitis								
Vaccina								
Total	3	100						
II.—CONSTITUTIONAL DISEASES.								
Adynamia	1	33.33						
Anæmia								
Hydrops								
Lumbago	3	100						
Rheumatismus acutus	3	100						
Rheumatismus chronicus	13	433.33	5	166.66				
Rheumatismus gonorrhœicus								
Syphilis primitiva								
Syphilis consecutiva								
Total	20	666.66	5	166.66				
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia	1	33.33						
Epilepsia								
Mania								
Nausea marina	1	33.33						
Néuralgia	5	166.66	2	66.66				
Paralysis								
Pleurodynia	1	33.33	1	33.33				
Vertigo	1	33.33						
Total	9	300	3	100				
II.—DISEASES OF THE EYE.								
Conjunctivitis ..								
Iritis								
Ophthalmia								
Total								
III.—DISEASES OF THE EAR.								
Otitis								
Otorrhœa								
Total								
IV.—DISEASES OF THE TEETH.								
Odontalgia								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysm								
Palpitatio								
Phlebitis								
Total								

TABLE IV.—Showing the number of cases, the invalided, and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 30.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma.....								
Bronchitis acuta.....								
Bronchitis chronica.....	1	33.33						
Catarrhus.....	2	66.66						
Phthisis pneumonica chronica.....	2	66.66	2	66.66				
Pleuritis.....								
Pneumonia.....								
Total.....	5	166.66	2	66.66				
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus.....								
Colica.....								
Constipatio.....								
Diarrhœa acuta.....	3	100	1	33.33				
Dysenteria acuta.....								
Dysenteria chronica.....								
Dyspepsia.....								
Fistula in ano.....								
Gastritis.....								
Hæmorrhoids.....								
Hernia.....								
Icterus.....								
Pharyngitis.....								
Stomatitis.....								
Tonsillitis.....	2	66.66						
Vermes.....								
Total.....	5	166.66	1	33.33				
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Balanitis.....								
Colica nephritica.....	1	33.33						
Chancroides.....	1	33.33						
Cystitis.....								
Dysuria.....								
Epididymitis.....								
Gonorrhœa.....								
Orchitis.....								
Phymosis.....								
Prostatitis.....	1	33.33						
Urethræ strictura.....								
Varicocele.....								
Total.....	3	100						
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis.....								
Synovitis.....								
Total.....								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....	1	33.33						
Anthrax.....								
Ecthyma.....								
Eczema.....								
Erythema.....	1	33.33						
Furunculus.....	1	33.33						
Herpes.....								
Onychia.....								
Paronychia.....								

TABLE IV.—Showing the number of cases, the invalided and the

Diseases and injuries.	BETWEEN 45 AND 55 YEARS. (Mean force, 30.)							
	Cases.		Invalided.				Died.	
	Number.	Ratio ‰.	To hospital.		From serv- ice.		Number.	Ratio ‰.
			No.	Ratio ‰.	No.	Ratio ‰.		
B.—LOCAL DISEASES—Continued.								
DISEASES OF THE INTEGUMENTARY SYS- TEM—Continued.								
Pemphigus.....								
Ulcus.....	1	33.33						
Urticaria.....								
Total.....	4	133.33						
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis.....	1	33.33						
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Condyloma.....								
Cystis.....								
Fibroma.....								
Total.....								
C.—POISONS.								
Alcoholismus.....	2	66.66						
Delirium tremens.....								
Ebriositas.....								
Total.....	2	66.66						
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....	1	33.33						
Ambustio.....								
Concussio spinalis.....								
Congelatio.....								
Contusio.....	5	166.66						
Fractura.....								
Luxatio.....								
Stremma.....	2	66.66						
Vulnus contusum.....								
Vulnus incisum.....	2	66.66						
Vulnus laceratum.....	2	66.66						
Vulnus punctum.....								
Total.....	12	400						
Grand total.....	64	2,133.33	11	366.66				

dead, in decennial periods, with the ratio per thousand—Continued.

ABOVE 55 YEARS. (Mean force 10.)								TOTAL. (Mean force, 994.)							
Cases.		Invalided.				Died.		Cases.		Invalided.				Died.	
Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.	Number.	Ratio ‰.	To hospital.		From service.		Number.	Ratio ‰.
		No.	Ratio ‰.	No.	Ratio ‰.					No.	Ratio ‰.	No.	Ratio ‰.		
2	200							1	1						
								29	29.17	1	1				
								2	2.01						
4	400							131	131.78	5	5.03				
								25	25.15	4	4.02				
								1	1						
								1	1						
								1	1						
								3	3.01						
2	200							32	32.19						
								1	1	1	1				
								3	3.01						
2	200							36	36.21	1	1				
								10	10.06						
								5	5.03						
								1	1					1	1
								2	2.01						
1	100							56	56.33	2	2.01				
								4	4.02	1	1				
								3	3.01						
								35	35.21						
								24	24.14						
2	200							19	19.11	1	1				
								14	14.08	2	2.01				
								3	3.01	1	1			1	1
3	300							176	177.06	7	7.04			2	2.01
18	1.800							1,014	1,020.12	85	85.51	1	1	4	4.02

SANITARY CONDITION

OF THE

NAVAL HOSPITALS.

NAVAL HOSPITALS.

The number of cases treated at the several hospitals during the year 1881 was 1,481. Of these 925 recovered, 111 were transferred to other hospitals, and 175 were invalided from the service. There were 36 deaths, and the average period of treatment was 44.23 days. The total loss of service amounted to 65,517 days. The average number of sick daily was 179.49. As compared with the previous year there was a decrease in the number of cases treated of 90, and of the loss of service of 8,951 days. The number of sick daily was less by 24.51, and the average duration of treatment by about 3 days. This decrease occurred chiefly in the class of zymotic, respiratory and genito-urinary diseases, and, in a lesser degree, in the constitutional, nervous, and absorbent class. There was a positive increase in the number of cases falling under the digestive and integumentary classes, and also of the diseases from violence. There was a diminution of 13 in the number of deaths.

NAVAL HOSPITAL, CHELSEA, MASS.

At this institution the number of cases treated was 267, an increase of 66 over the number of the previous year. Of these, 160 were cured, 6 were transferred, 26 invalided from the service, and 5 died, while 70 remained under treatment at the close of the year. The average number sick daily was 36.17, and the average duration of treatment 49.45 days.

In the zymotic class there were 19 cases, causing a loss of service of 854 days. The causes were chiefly: 5 of scarlatina, 3 each of erysipelas and remittent fever, and 2 each of simple continued, typhoid, and intermittent fevers. The average duration of treatment was 44.94 days. There were 2 deaths here from scarlatina.

The constitutional cases were considerably more frequent than in the preceding year, 63 cases having been treated as against 35 in 1881. Thirteen of the cases were of debility from malarial affections, brought here to recuperate, and there were 16 of rheumatism and 29 of syphilis. The loss of service amounted to 2,848 days, the average duration having been 42.20 days.

Eleven cases were entered under the head of diseases of the nervous system, of which 5 were of mania, and 2 of dementia. Three of the former were transferred, and single cases of epilepsia, mania, and neuralgia were invalided from the service. The loss of service was 724 days, the average duration being 65.81 days.

There were 47 cases reported of disease of the respiratory system, as against 23 last year, with a resulting loss of service of 2,416 days. The cases chiefly included in the returns were 29 of bronchitis, 12 of phthisis, 3 of pleuritis, and 1 of pneumonia. Seven cases in all were invalided, and there were 2 deaths from pneumonia and phthisis. The average duration of treatment was 51.40 days.

The group of diseases of the digestive system yielded 18 cases, the same number as last year, and the loss of time amounted to 695 days. The diseases most frequently noted were: 4 of tonsillitis, and 3 of anal fistula. The average number sick daily was 7.11, and the average duration of treatment 38.61 days. But 1 case was invalided.

The number of cases of genito-urinary diseases treated was 32, nearly the same as the number of last year, 39. Of these, 13 were gonorrhœa, 5 strictura urethræ, and 4 orchitis. The loss of service amounted to 2,130 days, and the average number sick daily was 5.83, while the average duration of treatment was 66.56 days. Two cases of stricture and 1 of orchitis were invalided from the service.

Diseases of the integumentary system yielded 34 cases, an increase of 11 over the number last year. The cases most numerous were scabies, of which there were 19. The number of sick days was 1,171, and the average duration of treatment 31.5 days. There was no invaliding.

Sixteen cases of sickness from violence were treated as against only 5 last year. Eight were of fracture, and 3 each of contused wound and stremma. The number of sick days was 881, and the average number sick daily 2.41. The average duration of treatment was 55.06 days.

Medical Inspector A. C. Gorgas makes the following report:

The hospital is built upon a terrace on the side of a hill, on the left bank of the Mystic River. Opposite is Charlestown, now a part of the city of Boston; to the left, the long bridge which connects Charlestown and Chelsea; beyond that, a part of the harbor, and East Boston in the distance, and over the tall chimney of the navy-yard the dome of the capitol on Beacon Hill is visible. Nothing, however, of Chelsea is to be seen from this part of the hospital grounds. The hill which conceals it, and which rises behind the main hospital building, shelters the latter from the northeast winds which prevail at times in the winter.

The hospital fronts to the southwest. The summer winds draw down the river and become nearly westerly, owing to the conformation of the river banks, and the situation of the towns, which increase their force and furnish, almost constantly during warm weather, fresh, cool breezes.

The land belonging to the hospital is about 60 or 70 acres; originally there were 115, but 10 acres were transferred to the Marine Hospital Service, upon which, beyond the summit of the hill, a hospital is built, and the rest to the Ordnance Department of the Navy, now the site of the magazine and other buildings.

The situation of this hospital is the best on the eastern coast. It is about half a mile from the nearest gate of the navy-yard, with which it is also communicable by water, and possesses an excellent boat landing at the end of a stone pier, built out beyond low water, where the sick may be disembarked from ships' boats or small steamers. The main hospital building is handsomely built of granite; it is 149 feet long by 71 feet deep. The original building, which was completed in 1836, was about one-half the size of the present one, the addition having been made in 1865. Besides the cellars and attic, there are three floors. The ground floor contains the central hall, from which the main stairway ascends, passages to the right and left, forming a cross, communicating with the following apartments, viz: The dispensary and medical store-room, the offices of the chief medical officer and the officer of the day, the reception-room, dining-room of officers' mess, quarters of a passed assistant surgeon (two rooms), employés' dining-room, patients' mess-hall, kitchen, and pantry. The first and second floors contain, each, one long ward, $65\frac{1}{2}$ by $21\frac{1}{2}$ by 14 feet (about 20,000 cubic feet), and five wards each, $26\frac{1}{2}$ by $21\frac{1}{2}$ by 14 (about 8,000 cubic feet). On these two floors, besides quarters for two medical officers, of two rooms each, with bath-rooms, water-closets, &c., there are six rooms for sick officers, two of which are large enough to contain two patients, if necessary. In the attic are numerous rooms for employés, lumber, and a strong room with grated door for a cell. One of the small wards on the first floor is used at present as a linen-room, and another as a smoking-room for patients. The rooms containing the baths and water-closets for the patients in the wards are objectionably placed in central positions, two on each floor, between the long ward and one of the small wards on each side. They are small, dark rooms, having no windows opening into the outer air. These are ventilated, like the wards in the new part of the hospital, by means of flues in the partition walls, which ascend beyond the roof through chimneys. To improve these apartments nothing short of removing them altogether would suffice. They should be placed in an outer tower free from the main building, with which communication should be had by galleries,

which should be closed with double doors. There is, however, but little foul odor, and none of the effects of sewer-gas has been perceived since I have been here. Disinfectants are freely used twice daily in the water-closets. The ventilators are very active in the wards in certain conditions of wind and weather, but the system possesses the defect of carrying the air from the lower stories into the rooms above, as shown by the mint test. In summer the numerous windows and free circulation keep the air sufficiently pure. The width of the halls and corridors with which the wards communicate, as the doors are always open, adds greatly to the general air space in the building. The old part of the hospital has no system of ventilation beyond transom windows near the ceilings, by which all the rooms and passages are made to communicate. There is a large skylight in the roof over the central main staircase. The building is warmed in winter by means of steam pipes. The boiler-house is in the rear. There is an engine attached, which runs the washing-machines in the contiguous laundry—there is a dryer in this office. Just in front of the laundry is an apartment sometimes used as a summer smoking-room for patients. The coal-shed extends beyond the hospital on a line with the steam-house, and at its extremity is the dead-house. The space between the boiler-house, part of the laundry, and the hospital, forms a court, which is paved with cobble-stones. Into this the back door opens, and with it the kitchen almost directly communicates. Through this are brought provisions and supplies.

The hospital is intended to accommodate one hundred patients, but, including officers' rooms, one hundred and twenty might be comfortably cared for, and, in an emergency, by converting the dining room into a ward, and using the main hall for a mess-room, eighteen or twenty more patients might be provided for. Including the small-pox hospital as well, which would hold eighteen, the extreme capacity of the hospital would be about one hundred and fifty-eight.

The small-pox hospital is a wooden building about one-sixth of a mile from the hospital, standing in a meadow near a point formed by a bend in the river. It is admirably placed, being near no other dwelling, and is well adapted for the treatment of contagious diseases, albeit rather small. It is two stories high, the ground floor containing four chambers for officers, with a bath and water-closet, and the first floor, two wards, with a nurse's room between. There is an "L" extension in the rear, in which are a kitchen and two bed-rooms for the attendants. This is occupied by one of the employés and his family, who keep the place in order and take charge of patients. Scarlet fever and measles have been treated here during the year. The house is heated by stoves, and the hot water which is laid onto the bath is supplied by the kitchen range.

The water supply of the hospital comes from the Mystic River water-works. It is satisfactory both in quantity and quality. Filters screwed onto the hydrants are in use for the water used for drinking and cooking. Tanks in the attic supply a sufficient flow to flush the water-closets thoroughly. The sewage of the hospital empties into the Mystic River.

There could hardly be chosen a more desirable situation for a hospital than this one. There is no malaria; there is no endemic disease. Invalids from the tropics, for at least eight months in the year, find precisely the conditions necessary to hasten convalescence and restore health and strength. With all the advantages of town, the air and surroundings are as much those of the country as though the neighboring cities were many miles distant. Patients come to this hospital from this station, the one at Portsmouth, N. H., that at New London, Conn., and the training station and ships at Newport, R. I.

There was no case of original disease among patients or employés during the year. In spite of the rigorous winter weather the climate of this region is a wholesome one. The larger proportion of deaths from pulmonary diseases than in more southern latitudes is offset by a smaller number of affections of other parts. The death rate for the year of Boston was 23.23 per thousand.

Diseases of the lungs, including pulmonary phthisis and pleuritis constituted more than one-fourth of the whole number of deaths. In regard to diseases of the respiratory organs, it is observed here, as elsewhere, that those whose occupations or habits compel or permit to live outdoors principally enjoy a greater immunity from these affections than those whose lives are sedentary and within doors.

The employés on the line of horse railway between Chelsea, Lynn, and Boston, about thirty-two in number, who were exposed all day and part of the night to the vicissitudes of weather and temperature during the severe winter of 1882-'83 (since when this is written) were, without exception, free from disease of the respiratory system.

NAVAL HOSPITAL, BROOKLYN, N. Y.

The number of admissions into this institution during the year, including those remaining from last year, was 213, a very large diminu-

tion from the preceding year, when it was 386. The number restored to duty was 213; 83 were transferred to hospital, these being in most cases a discharge for the original complaint and a readmission for a new diagnosis; 55 were invalided from the service; 7 died, and 28 were continued. The loss of service aggregated 11,965 days, and the average number sick daily was 32.76; the average duration of treatment was 30.99 days.

The returns from this hospital included 28 cases of zymotic diseases, an increase of 1 over the number of last year. They were chiefly, 13 of febris intermittens, 4 of erysipelas, 2 of febris remittens and febris enterica respectively, and single cases of morbilli, variola, and phagedœna putris. The loss of service was 811 days; the average number sick daily was 5.75, and the average duration of treatment was 28.96 days. There was no invaliding.

The cases of constitutional diseases numbered 109, a diminution of 21 as compared with last year. The cases included 41 of syphilis, 47 of rheumatism, 12 of adynamia, and 2 of carcinoma. There were 14 invalided from the service, and the average duration of treatment was 37.34 days. The average number sick daily was 7.81, and the total loss of service amounted to 2,848 days.

The nervous affections contributed 25 cases, or 3 fewer than last year. Of these 7 were of epilepsy and 6 of paralysis. Two of the former were invalided from the service, as were 5 of the latter, and there was 1 death from paralysis. The number sick daily averaged 2.09, and the total loss of service was 764, the average duration of treatment having been 30.56 days.

The diseases of the respiratory system were represented by 27 cases, a diminution of 40 from the number of last year. The principal factors of this class were, bronchitis acuta 6, phthisis 8, pleuritis 4, pneumonia 3. All the cases of pneumonia ended fatally, as did 1 of phthisis. Two cases of phthisis and 1 of pleuritis were invalided. The aggregate loss of service was 713 days, the average number sick daily was 1.95, and the average duration of treatment was 26.40 days.

Under the head of diseases of the digestive system 56 cases were reported, an increase in this class of 19 cases as compared with last year. The diseases contributing most largely to the class were, hernia 14 cases, dyspepsia 9, and diarrhœa acuta 8. Nine cases, mostly hernia, were invalided from the service, and there was one death from ascites. The total number of sick days was 1,401, the average number sick daily was 3.83, and the average period of treatment 25.01 days.

The class of genito-urinary cases yielded 37 cases, as against 38 in the preceding year, of which 1 case respectively of albuminuria and nephritis were invalided, while 1 death occurred from the former disease. The average duration of treatment was 27.94 days and the average number sick daily was 2.83, so that the time lost to the service amounted to 1,034 days.

The number of cases of skin disease was 23, a small decrease from the number reported in 1881, which was 28. The principal factors were abscessus 9, ulcer 5, furunculus and acne, of each 2. One case of the latter and 1 of ulcer were invalided. The time lost was 860 days, and the average number sick daily was 2.35, while the average duration of treatment was 48.25 days.

Diseases from violence gave 32 cases as against 25 in the preceding year. A single case of stremma was invalided, and the average duration of treatment was 883 days. The average number of sick daily was 2.41, and the duration of treatment was 27.59 days.

In his annual report Medical Inspector D. Bloodgood remarks :

The records of the naval hospital at the United States naval station, New York, for the year 1882 are not remarkable for anything unusual in the number or nature of diseases or injuries, nor for anything phenomenal in sanitation; but they exhibit satisfactory data and results in all matters pertaining to its specific province, and sustain, with a year's further experiences, the claim that this hospital is unquestionably healthful as to site, that its locality is most convenient for the station, and that its appointments are suitable and sufficient for all legitimate requirements.

The more important surgical cases were: 2 fractures of ribs; 2 fractures of tibia; 2 fractures of fibula; 1 compound fracture of tibia and fibula; 1 fracture of femur at junction of middle and lower third; 2 fractures of radius; 1 fracture of clavicle; 1 dislocation of humerus. The operations were: 1 for ankylosis of fingers; 1 ligature of hæmorrhoids; 2 of removal of redundant prepuce; 1 removal of sarcomatous tumor from dorsum of hand; 1 amputation of leg; 1 amputation of finger; 1 removal of first phalanx of thumb; 1 removal of fatty tumor of thigh; 1 perinephritic abscess evacuated under spray; and numerous lesser operations.

The only contagious diseases under treatment were two cases of variola. Of the 7 deaths 3 resulted from pneumonia, one of these with accompanying pyæmia, the second admitted in a state of collapse, and dying within six hours, and the third suffering also from syphilitic asthenia; 1 from albuminuria—case of an old inebriate; 1 from chronic phthisis; 1 from ascites consequent upon carcinoma of the stomach and atrophy of liver; 1 from cardiac paralysis with extreme thinness and friability of heart tissue. Autopsies were made in each case.

The filling in of the slough between Washington avenue and the western boundary of this hospital, which has been going on steadily for three years, is about completed, and the sanitary advantage of that work is markedly perceptible. The land thus reclaimed and other unused portions of the Government reserve, comprising over 50 acres, are recommended, in the last annual report of the honorable Secretary of the Navy, to be sold. According to the map or plan to exhibit these lands it is proposed to include a narrow strip from the western side of the grounds belonging to this hospital—cutting in and off at starting from Flushing avenue about 15 feet, but gradually widening the strip to maintain a parallelism with Washington avenue, as the line is run through to the Wall about basin. The avowed object of this paring is only to establish straight lines and symmetrical lots in this region of irregular and winding streets, lanes, and thoroughfares. But on this little strip would be left out our substantial boundary and protecting wall of brick; and the hospital sewer, which was constructed four years ago at a cost of \$1,461.50, would needs be destroyed, and the water-pipes laid alongside it displaced, and the serviceable barn and stables belonging to the laboratory, and some of the hospitals also thrown out, and many invaluable trees cut down. All this seems too great a sacrifice for the slight monetary gain. If it is a necessity that some of our territory must be taken a few lots off the northwestern portion could better be spared; but it is to be hoped that this essentially an oasis will suffer no material curtailment.

The naval cemetery within these grounds has been in use over sixty years. No record can be found of the interments prior to 1831, when an old roadway was closed in as an addition to the space, but since that date over 1,100 have been registered, and it is estimated that about 2,000 corpses have been here buried in the little plot of but one and a half acres. Nearly every available spot has been occupied—indeed, it has several times occurred that in digging a new grave an old one has been encroached upon and parts of skeletons exhumed—so what as a sanitary measure has long been desirable is now become a natural necessity, and it is incumbent either that some better method of disposing of the dead be devised, such, for instance, as incineration, or that a plot be procured in one of the neighboring cemeteries (advisably "The Evergreens," as the nearest) for future interments, and to which the remains here buried may be removed; and when this burying-ground shall have been cleared and unoccupied the land might be advantageously sold, and its proceeds could not be more worthily employed than in effecting repairs and modifications in this hospital establishment—such as the introduction of the "screw-joint iron house-drainingsystem" in place of the leaden pipes and style of plumbing now in use, which requires almost constant tinkering; the substitution of cement or porcelain tubs for the wooden ones in the laundry, which absorb and retain unavoidably impurities from the clothing and bedding therein washed; concrete pavements around the buildings in lieu of the cobblestones over which the carts and wagons now so noisily and disturbingly rattle; fitting a hot-air and steam-bath apartment, electric bells, &c.

NAVAL HOSPITAL, PHILADELPHIA, PA.

There were under treatment at this establishment during the year 204 cases a decrease from 232 cases in 1881. Of this number 150 returned

to duty, 2 were transferred to other hospitals, 10 were invalided from the service, 12 died, and 30 were continued to the following year. The average number daily under treatment was 27.01, the average period of treatment was 48.33 days, and the aggregate loss of service amounted to 9,861 days.

The class of zymotic diseases included 27 cases, which were largely of malarial origin, 17 cases of intermittent fever, and 3 of remittent having been returned, and there were 4 of erysipelas. No deaths occurred, and there was no invaliding. The loss of service amounted to 562 days; the average number sick daily was 1.53, and the average period of treatment 20.81 days.

There were reported 35 cases of constitutional diseases, as against 41 last year. They included 13 cases of rheumatism, 5 of syphilis, 4 of senectus, and 11 of adynamia and anæmia. The deaths were as follows: 2 of adynamia, 1 from carcinoma, and 1 from senectus. Five were also invalided from the service—3 from adynamia, 1 from rheumatism, and 1 from syphilis. The average number sick daily was 7.33, the average period of treatment was 76.48 days, and the total loss of service was 2,677 days.

Diseases of the nervous system contributed 20 cases, of which one-half were of paralysis, occurring among the aged beneficiaries at the naval asylum. Three of these died, as did 1 of dementia. Two cases of mania were invalided from the service. The total number of sick days amounted to 1,550 days, the daily average sick rate being 4.24, and the average duration of treatment 77.5 days.

The diseases of the respiratory system were represented by 19 cases, nearly the same as last year. Five were of pneumonia, 3 of asthma, and 3 of phthisis. One death occurred from each of the two latter diseases. The loss of service was 1,552 days, and the average number sick daily was 4.25, while the average period of treatment was 81.68 days.

The class of diseases of the digestive system yielded 29 cases, as against 22 last year. Dyspepsia contributed the largest number, 7, and there were 4 each of diarrhœa acuta, hæmorrhoids, and hernia. One case of dysentery was invalided, and a death occurred from dyspepsia. The average number sick daily from these affections was 2.89, and the average period of treatment was 36.48 days, making the total number of sick days 1,058.

Diseases of the genito-urinary system gave 12 cases, corresponding nearly to the number last year, which was 11. The chief factors were albuminuria, 3; gonorrhœa, 2; cystitis, 2, and nephritis, 2. One case of enuresis was invalided. The loss of service equaled 617 days, and the average number sick daily was 1.69.

Six cases only were noted in the class of skin diseases, of which 3 were of abscess. The number of these cases treated last year was 15. There was a loss of time of 376 days, an average of 62.66 for each case, and the average number sick daily was 1.03.

Injuries contributed 18 cases, as against 14 cases last year. One case of lacerated wound was invalided from service. The average period of treatment was 40.38 days, and the number sick daily was 1.99, so that the total number of sick days was 727.

NAVAL HOSPITAL, WASHINGTON, D. C.

The returns from this institution indicated the admission of 150 patients, a diminution of 62 from the number of the previous year. Of

these 121 recovered, 2 were transferred to other hospitals, 7 were discharged from the service, and 2 died, while 18 remained for further treatment. The total number of sick days was 5,294, the daily average number of sick 14.50, and the average duration of treatment was 35.29 days, somewhat greater than last year.

In the zymotic class of diseases were reported 25 cases, of which 20 were of intermittent fever, 1 of remittent, and 2 of enteric fever. These figures show a decided diminution since last year, the number of admissions then having been 69. The average duration of treatment in these cases was 20.12 days, and the daily average number sick was 4.07. There was no invaliding, and the total loss of service was 503 days.

The class of constitutional diseases was represented by 20 cases, as against 33 last year. Of these 10 were of syphilis, 6 of rheumatism, and 4 of debility, following malarial fevers. The total loss of time was 3,273 days, the average number sick daily was 2.44, and the average duration of treatment was 44.55 days. One case of rheumatism was invalided from the service.

Ten cases were returned of diseases of the nervous system, the most important being single cases of apoplexia, dementia, epilepsia, insomnia and mania, and 3 of neuralgia. The loss of service was 245 days, and the average duration of treatment 24.1 days. The numbers of admission and sick days corresponded very closely with those of last year.

There were 19 cases treated of diseases of the respiratory system, or 3 less than in 1881, of which 7 were of bronchitis, 5 of phthisis, 2 of pleuritis, and 4 of pneumonia. There were 2 deaths from phthisis, and 1 was invalided from this disease, as well as 1 from pneumonia. The average number sick daily was 1.97, the average duration of treatment 37.89 days, and the total number of sick days reached 720.

The cases of diseases of the digestive system numbered 14 as against 22 last year, and the principal factors were, tonsillitis, 4; hernia, 2; and icterus, 2. The average duration of treatment was 22.78 days; the average number sick daily .87, and the total loss of service 319 days.

The genito-urinary cases were 18 in number, as against 21 last year, contributing a loss of 656 days. One case of orchitis was invalided from the service. The average period of treatment was 36.44 days, and the number sick daily was 1.79.

The number of injuries treated was 17, an increase of 7 over the number of last year. One case of fracture and 1 of stremma were invalided from the service. The average number sick daily was 1.99; the average duration of treatment 36.88 days, and the total loss of service amounted to 627 days.

In his sanitary report, Medical Director J. Y. Taylor makes the following remarks:

The malarial cases generally made speedy recoveries when uncomplicated. Rarely more than one or two paroxysms have occurred subsequent to admission. The well-known combination of arsenic and iodine used in the treatment of some of the old and frequently recurring malarial affections has fully sustained its reputation and has proved more effectual here than large doses of quinine. While this neighborhood is undoubtedly malarious, there appears to be good evidence that the second-story hospital wards are nearly exempt, being above the heavier strata of the miasm, and this may, in some measure, account for the rapid convalescence of patients of the class last mentioned.

UNITED STATES NAVAL HOSPITAL, D. C., FOURTH QUARTER, 1882.

D. H. C., cockswain; nat., Mass. Admitted from United States Fish Commission steamer Fish Hawk, November 10, 1882. Caries (lower jaw).

The disease originated from a carious tooth and resulting abscess in the alveolus of the same (right lower canine). There is now a fistulous opening through the lower

maxilla from before backward, lined by carious bone, and discharging pus. A probe can be passed completely through the fistula.

Condition upon admission as above described. The fistulous opening below is situated near the median line, on the internal aspect of the lower jaw, and penetrates the soft parts beneath the chin. Above, the orifice is at the base of the alveolar process on the external surface of the maxilla, discharging freely whitish pus. The saliva also finds its way through the sinus. Posterior to the lower opening is a cicatrix an inch in length, and a small depression in the bone, the remains of an operation done ten years ago. The probe reveals a cavity in the maxilla and carious bone, but the exact size of the cavity cannot be determined.

The general health of the patient appears to be excellent. He states that the beginning of this trouble dates back as far as fourteen years, first the root of the right lower cuspid tooth became diseased (periodontitis), and he being at that time on a whaling voyage, could not have it attended to, and the result was an alveolar abscess, which burst externally, leaving a cavity in the bone, and a fistulous opening through the skin, which has been a source of constant annoyance ever since, as, when the tooth was finally extracted, the running sinus remained, caries of the jaw-bone having probably already commenced. In addition to the operation referred to, the affection has been treated with a variety of local applications without benefit.

November 15.—An incision 2 inches in length was made at the base of the alveoli, including the upper opening of the sinus, and extending beyond the middle of the chin. The soft parts were dissected away from the bone, and an entrance made into the carious cavity, from which, with the gouge and forceps, twelve pieces of bone were removed, the largest being three-fourths of an inch long and half an inch wide. No anæsthetic was used, as the patient determined to dispense with it on account of some unpleasant effects which he remembered at his last operation. Dressing, dry lint compress and bandage; lotions, zinci chlorid. (gr. iij— ζ i) and liq. sodæ chlorinat. diluted, p. r. n. Diet, milk, beef-tea, and thin gruel, to be taken from a feeding-cup with a long spout.

November 16.—Considerable soreness but no pain; discharge not profuse, less in amount than before the operation, and consists of bony detritus, and a small portion of pus stained with blood. Continue dressing and lotions as required.

November 17.—Doing well; has taken pil. hydrag. gr. x, and a seidlitz aperient. continue compress and bandage, &c.

November 18.—Discharge from the sinus below much diminished, amounting to only a few drops of pus colored with blood in the last twenty-four hours, using the diluted liq. sodæ chlorinat. as a mouth-wash. Continue dressing.

November 19.—Discharge very slight, being only sufficient to saturate one thickness of lint in twenty-four hours; no pain whatever and less of the "sore" feeling in the jaw; doing well in all respects.

November 29.—The patient is taking soft solid food. As there is still a slight discharge from the opening under the chin, containing small particles of disintegrated bone, an injection was ordered of dilute aromatic sulphuric acid (1-3) to be used with a syringe several times a day.

December 5.—The discharge has apparently ceased. Discontinue dressings.

December 8.—Both the upper and lower openings of the sinuss are still patulous, the upper being very small, not large enough to admit the point of the syringe. The cavity is washed out from below several times daily with the chloride of zinc solution of November 15. Sometimes minute fragments of the organic portions of bone are expelled by the injection from the upper orifice. These particles, upon being collected in a mass and dried, give no reaction with hydrochloric acid.

December 15.—A slight discharge having reappeared, the injection of the dilute aromatic sulphuric acid was resumed, with the effect of immediately causing it to cease. To continue the injection four or five days as occasion may require.

December 20.—No purulent discharge. A small amount of saliva enters the superior opening, and part of it passes out below. Since last note, one thin scale of bone was extracted from the upper opening.

December 25.—The nitrate of silver stick has been freely applied to the orifice in the alveolus. The maxillary cavity was carefully probed without finding any diseased bone, but the probing started a slight hemorrhage. Cavity washed out occasionally with the chloride of zinc solution.

December 31.—The fistulous openings have not entirely closed, but there is no discharge of pus, and no evidence of carious action in the maxillary cavity. Patient not yet dismissed from the hospital.

G. W. B., O. S., nat. Providence, R. I.

Admitted November 7, 1882, with the statement that he was placed on the sick list on board the U. S. S. Despatch fourth rate, November 3, 1882, and that his urine was tested and found albuminous.

At date of admission to the hospital he complained of severe pain in lumbar re-

gion, both sides, cough and pain in upper left side of chest, feet and legs slightly oedematous, but sufficiently so to pit distinctly upon pressure with the finger. Inspiratory murmur exceedingly rough on both sides; pain sharply increased by attempting to take a full inspiration. Had a very soft endocardial murmur at the ensiform cartilage; second sound of heart strongly accentuated. Temp., 101.8° F.; pulse, 84; resp., 40. Total absence of appetite. Said he had not eaten anything for two days. Tongue heavily coated and breath offensive. Had pilul hydr., gr. x, ext. colocynt comp., gr. v. M.

November 8.—Took last night potass. bromid., gr. xxx, and tr. hyoseyami, 3ii. Has less pain in chest this morning and can take a full inspiration. Temp., 101° F.; pulse, 84; resp., 30. Urine: Sp. gr., .1025, bloody albuminous (fully 50 per cent. of albumen). There is blood enough to make the urine appear quite red. R., tinct. guaiac 3i every two hours in a wine-glassful of milk. R., tinct. hyoseyami 3ii H. som. 6 p. m.: Temp., 102.2° F.; 9 p. m.: 100.8° F.

November 9.—Temp., 101.2° F. Urine still contains blood, but smaller amount. "Feels better." Continue the tinct. guaiac as directed yesterday. R., potass. bromid., gr. xxx. Take at 9 p. m. Temp. 12 m., 102.4° F.; 6 p. m., 102.8° F.; 9 p. m., 102° F.

November 10.—Very small quantity of blood in the urine. Pain and swelling with effusion in left knee joint (synovitis). Appetite poor, but he has taken a little soup and milk. Continue tinct. guaiac 3i four times a day. Temp., morning, 101.6° F.; 9 p. m., 103.2° F.

November 11.—Urine apparently free from blood, but under the microscope numerous blood corpuscles appear, and immense numbers of micrococci. Knee improving with a lead-water and laudanum application. Temp., 8 a. m., 101.3° F.; 12 m., 102° F.; 6 p. m.; 102.3° F.; 9 p. m., 102.8° F. No casts have yet been found in the urine, although careful search has been made for them on several occasions.

November 12.—Knee doing well; the effusion is stationary, but pain is greatly diminished; urine nearly normal in color; abundant sediment. To begin to-day on exclusive milk diet. R., spts. æther nit. 3i four times a day.

November 13.—Says he feels much better than usual this morning, and enjoys the milk, which "tastes natural." Heavy cloud of mucus in urine. Temp. down to 99.4° F. at 8 a. m.; 6 p. m. 99.5° F.

November 15.—Temp. 8 a. m., 98.2° F.; 6 p. m. 98.4° F. Knee well; the effusion has disappeared; improved in all respects, but "feels weak;" has lost in weight rapidly, not known how much.

November 17.—Doing well. Has a good appetite, but appears emaciated, continue milk diet *ad lib*.

November 18.—Urine examined and found to contain only a trace of albumen. Sp. gr. 1016, acid reaction; clear except a slight haze of floating mucus. Discontinue all medicine, and continue milk diet. Temp. normal, no œdema.

November 19.—Mess-table diet. Says he feels "as well as ever."

November 21.—Required an aperient, pil laxativ., No. ii, H. som.

November 28.—No albumen in urine; rapidly regaining strength. The patient states that he had an attack, somewhat similar to this, once before, during which blood appeared in the urine, but he did not feel so ill as on this last occasion.

December 4.—Discharged to duty, apparently well.

NAVAL HOSPITAL, NORFOLK, VA.

The number of cases treated at this institution during the year was 233, a diminution of 111 from the number of the previous year. The number of sick days aggregated 13,652, and the average number sick was 37.40, as against 44.33 last year. The disposition of the cases was as follows: 140 were restored to duty, 9 were transferred to other hospitals, 29 were invalided from the service, 7 died, and 48 were continued. The average duration of treatment was 58.59 days.

In the zymotic class were included 36 cases, as against 53 last year. They included 12 of intermittent fever, 13 of remittent fever, and 1 of typhoid fever, from each of which there was a death, and there were single cases of morbilli, parotitis, and simple continued fever. One case of remittent fever was invalided from the service. The average number sick daily from these affections was 4.07, the average duration of treatment was 41.30 days, and the total loss of service amounted to 1,481 days.

The class of constitutional affections was represented by 49 cases, showing an increase of 8 over the number of last year, and giving a loss of time equal to 3,273 days. The cases were chiefly, 17 of syphilis, 21 of rheumatism, and 9 from adynamia. Five cases of the latter, and 1 each of the former were invalided from the service. The number sick daily averaged 8.96, and the average duration of treatment was 66.79 days.

Ten cases were grouped as nervous affections, an increase of 1 as compared with last year. There was 1 death from cephalalgia, the patient having been admitted with that affection. Abscess of the brain, however, developed, which was the cause of death. One case of epilepsy, and 1 of neuralgia were invalided from the service. The number of the daily sick was .75, and the average duration of treatment was 27.6, so that the loss of time was 294 days.

There were 24 cases returned under the head of diseases of the respiratory system, a considerable reduction as compared with the number of last year, 39. The principal factors were, phthisis 4, pleuritis 2, pneumonia 2, bronchitis 9. Four cases of the latter affection and 1 of phthisis were invalided from the service, and there was 1 death from pneumonia. The average number sick daily was 3.92, and the total loss of time was 1,431 days, or 59.62 for each case.

There were entered 28 cases of diseases of the digestive system, nearly double the number of last year, which was 15. The resulting loss of service was 1,558 days. Two cases of hernia and single cases of hepatitis chronica and hæmorrhoids were invalided from the service, and there was a death from cholera morbus. The daily average number of sick was 4.26, and the average duration of treatment 54.21 days.

The cases grouped as genito-urinary were 35 in number, 1 more than in the preceding year. They included 12 of chancroides, 5 of gonorrhœa, 6 of urethræ strictura, and 5 of cystitis. Two of the latter and 1 of the chancroids were invalided from the service, as was 1 of stricture. There were 2,373 sick days, the average duration of treatment having been 67.8 days, and the average number of daily sick 1.79.

Eleven cases of skin diseases were reported, mostly of abscess and ulcer. One of the latter was invalided. The number of sick days was 894, or 81.27 for each case.

The cases resulting from violence were 18, nearly the same as last year, and the amount of time lost was 953 days. Two cases of fracture, 1 of dislocation, and 1 of gunshot wound were invalided, and there was 1 case of death by drowning, the man in this case having been transferred to hospital, after death, for the purpose of burial. The average duration of treatment was 52.94 days.

NAVAL HOSPITAL, PENSACOLA, FLA.

The cases treated at this hospital were such as were contributed by the small force stationed at the navy-yard which escaped any encroachment of yellow-fever, although a severe epidemic prevailed at Pensacola. The number of cases returned were 15, about the number of last year, and the total number of sick days was 558, making a daily average number of sick of 1.52; while the average duration of treatment was 37.20 days. Two cases were invalided from the service, 12 recovered, and 1 remained under treatment. There were no deaths. Of the distribution of the cases among the various classes, it will be seen that the zymotic group was represented by 1, the constitutional and respi-

ratory by 2, the digestive by 3, the genito-urinary 1, integumentary 2, poisons 1, and diseases from violence 3.

Surgeon A. M. Owen makes the following remarks in his annual report :

The attention of the Bureau is invited to the drain and connecting pond, extending from one side to the other, east and west, through the grounds. The water flowing through these comes in great measure from a part of the army reserve and the intervening portion of the naval reservation, a comparatively high plateau, situated to the west of the hospital. During heavy rainfalls a sluggish current passes through the said drain and pond, there being from six inches to one foot of water in depth at such times within the channel of the waterway named. Usually, however, the stream is but two or three inches deep, and thus remains almost stationary, so as to become stagnant and filled with the various water-plants found in such places under similar circumstances.

Now, in former days, a steam engine was placed near the pond under consideration, and thus, no doubt, this receptacle for water was kept clean and sweet, the water being constantly removed in the service of the hospital. It thus served good ends. With the destruction of the engine, however, the usefulness of the pond and the connecting supply-drain departed, and they are both nuisances of decided magnitude in these days, and should, in my opinion, be filled up and thus obliterated. The drainage of the army reservation at Fort Barrancas ought to be made to flow into the bay beyond the western wall of the hospital, its proper and natural outlet. This work could readily be accomplished at little expense and labor. It is the belief of my predecessors that the pond and drain under consideration are the immediate cause of the so-called malarial troubles, which are said to come to all persons who reside at the hospital for any length of time.

NAVAL HOSPITAL, MARE ISLAND, CALIFORNIA.

The returns from this hospital for the year include 173 cases, only differing by 2 from the number last year. The number of sick days was 8,380, a reduction from last year of 1,565, while the average number sick daily, 22.95, was less by about 5. The average duration of treatment was 48.43, considerably less than in the former year. The number cured and restored to duty was 98; 40 were invalided from the service, and 2 died, while 33 were continued.

The zymotic class contained 14 cases, of which the largest number, 6, were of remittent fever, derived from ships returning from the malarious coast of Mexico. Four cases of morbilli were also treated and 1 of enteric fever. A case of febris continua simplex was fatal, and the single case of typhoid fever was invalided from the service. The daily average number sick from these cases was 1.76, and the average duration of treatment of the cases 45.92, the total loss of service amounting to 643 days.

The constitutional diseases were represented by 36 cases, as against 51 last year, contributing a loss of time equal to 1,813 days. The cases were 4 of adynamia, 1 of which was invalided, 10 of rheumatism, 4 being invalided, and 22 of syphilis, of which 7 were also invalided. The average number sick daily was 4.96, and the average duration of treatment was 50.36 days.

Eighteen cases were returned of diseases of the nervous system, an increase of 2 over the number of last year. Of these, 2 cases of neuralgia and single cases of dementia, epilepsia, melancholia, and pleuritis were invalided. The average number sick daily was 1.72, and the average period of treatment 35 days, the total loss of time being 630 days.

The diseases of the respiratory system furnished 28 cases, attended by a loss of service of 1,869 days. These figures show a considerable decrease since last year, when there were 39 admissions. The loss of time was also less, the average duration of treatment having been 66.75 for the present year, as against 51.43 last year. There were 10 inva-

lided from the service, 7 for phthisis, and 1 death from the same disease.

The cases falling under the class of diseases of the digestive system were 15, the same number as last year, or a daily average of 1.50. The average duration of treatment was 36.66, and the total number of sick days 550. Four cases of hernia and 1 of dyspepsia were invalided.

The class of genito-urinary diseases only furnished 7 cases, of which there were 2 of gonorrhœa, 2 of nephritis, and single cases of orchitis, cystitis, and enuresis, the last being invalided. The average duration of treatment was 75.11, the average number sick daily 1.45, and the total loss of service 530 days.

The diseases of the integumentary system were represented by 21 cases, of which 12 were of scabies received from the Independence. The remaining cases were 5 of abscessus and 3 of ulcer. The average number sick daily was 1.96, the average duration of treatment 34.23 days, and the total number of sick days was 719.

Eleven cases of injuries were reported from this hospital, 5 of which were fractures and 2 contusions. One of the former was invalided. The number of admissions corresponded to that of last year, but the average duration of treatment was less, having been this year 38.54, while in 1881 it was 48.96 days. The total number of sick days was 424.

The sanitary report from this hospital by Medical Director George Peck contains the following remarks:

No epidemic influence has prevailed at this station during the past twelve months. The only series of cases of special note was made up of some twenty men of the complement of the late U. S. S. Rodgers, admitted with symptoms closely resembling scabies. Upon more careful examination, however, no parasite was detected during their stay in hospital. The disease was rather scorbutic in character, the eruption of the skin being the outward expression of a condition of the system brought on by poor or unaccustomed food and drink, by living and sleeping in close, unventilated huts, and by other hardships incidental to life in the Arctic regions. With cleanliness, good food, and free ablution all recovered rapidly.

The main sources of the water supply of the Mare Island hospital are the reservoir of the town of Vallejo, which is in the hands of a private corporation, and a small reservoir on Mare Island, near the hospital, called Lake Rodgers, which collects the rainfall of a portion of the island, and which has a capacity of about 30,000,000 gallons. From the first source the water is brought to the island through an iron main which crosses the narrow strait separating Mare Island from the mainland.

During the rainy season the rain-water from the roof of the hospital is collected in two cisterns, and, from November to March, under ordinary conditions, this supply almost balances the consumption, which during these months is not so great as in the dry season. The water from Vallejo runs by natural flow into a cistern in the navy-yard proper, and is thence distributed by pumps throughout the island.

The proportion received by the hospital from this source is entirely inadequate for its needs, and during the dry months, from April to November, practically no water can be obtained for purposes of irrigation and for flushing the sewers except as supplied by steam-pump. The quality of this water is good, as the analysis in Note A shows.

The supply from Lake Rodgers, which is also distributed to the yard as well as the hospital, flows naturally into the above-mentioned cisterns, and is pumped thence into two large tanks of 3,000 gallons capacity each, at the top of the hospital. This is also the case with the water received from the common cistern in the yard proper, which is mixed with that from Lake Rodgers in the hospital cisterns when water is being received from both sources. The past winter, 1881-'82, has been so unusually dry that no water has been collected in Lake Rodgers, and since the cessation of rain the Vallejo supply is necessarily relied upon exclusively. During the previous winter, however, the rainfall was above the average, and after the lake was filled a large quantity was lost. The great fluctuation in the amount of rainfall in different years in California (see Note B) makes it necessary in building reservoirs to give them at least twice—and, to guard against the very probable contingency of two successive dry winters, three times the capacity of the anticipated annual consumption, including waste and evaporation. To make Lake Rodgers the exclusive source of water supply for the island would require a capacity of 39,000,000 gallons. Although the lake could, without great expense, and without proportionately increasing its surface-area be

enlarged to this capacity, the drainage area is not sufficient, under the most favorable conditions of soil and rainfall, as determined by the measurements of Civil Engineer Wolcott, of this station, to furnish this quantity in one season, and, hence, for a sufficient supply, recourse must still be had to some source outside of the island. The lake could, nevertheless, be made a most useful and desirable supplementary supply, and would be invaluable as a reserve in case of sudden cutting off of the Vallejo water by breaking of the main or otherwise, or in case of fire by enlarging it so that it would contain the maximum rainfall of the collecting area in any one year. At present there is no provision for filtering the water of Lake Rodgers, and under ordinary conditions this is scarcely necessary. After heavy rains, however, and when, after the long dry season, the water becomes low, and has been exposed to the sun for months, it should be passed through sand and gravel filters if it is to be used for drinking purposes. These filters could be easily introduced into the course of the supply flow.

At the time of making this report the level of the water in Lake Rodgers is so low that an analysis of it would not furnish a just idea of its average purity, and it was not made. Under the microscope, however, a sufficient number and variety of living and dead infusoria and vegetable *débris* was seen in fresh specimens of water to indicate considerable organic impurity.

NOTE A.—*Analysis of Vallejo water.*

Free ammonia, per liter.....	milligram.	.068
Albuminoid ammonia, per liter.....	do....	.074
Total oxidizable matter in terms of oxygen required to oxidize, per liter. do....		2.6
Chlorides, per liter.....	do....	202.35
Total hardness in degrees, Clark's scale.....		97.30
Permanent hardness, Clark's scale.....		71.40
Removable hardness, Clark's scale.....		25.90
Total solid matter, per liter.....	milligram.	109
Suspended matter, per liter.....	do....	15
Dissolved.....	do....	94

NOTE B.—*Rainfall at San Francisco from 1874 to 1877.*

[From Colonel Mendell's report.]

	Inches.
1874-'75.....	33.48
1875-'76.....	51.61
1876-'77, about.....	16

Extremes of rainfall at San Francisco are given in the same report at 7.4 inches in 1850-'51 and 49.27 inches in 1861-'62. In 1863-'64 and 1864-'65 the rainfall was respectively 13.6 and 10.08 inches, which shows two dry years in succession, a phenomenon by no means rare, as the report shows.

The average rainfall at San Francisco is about 23 inches.

NAVAL HOSPITAL, YOKOHAMA, JAPAN.

The number of cases treated at this hospital during the year was 53, a reduction of 12 as compared with the preceding year. Of these 31 were returned to duty, 6 were invalided from the service, and 9 were transferred to other hospitals at home, and there was 1 death. Six were continued for further treatment. The average duration of treatment was 49.09 days, and the average number sick daily was 7.12, making an aggregate loss of service of 26.02 days.

In the zymotic class there was but 1 case reported, which was of remittent fever, and was 33 days under treatment.

There were 14 cases of constitutional affections, as against 8 last year. They were composed of 8 cases of syphilis, 5 of rheumatism, and 1 of adynamia. Two cases of syphilis were invalided. The daily average number sick was 1.03, and the duration of treatment 52.92 days; the total number of sick days being 741.

The nervous diseases were represented by 6 cases, of which 3 were

neuralgia, and 1 case, respectively, of epilepsy, mania, and paralysis were invalided. This class shows a considerable increase from last year, when only 2 cases were treated. The average duration was 58.33 days, and the total loss of service 355 days.

Seven cases of respiratory diseases were noted, as against 12 last year. The principal factors were phthisis 2, pleuritis 3, and pneumonia 1. Five cases were invalided to the United States, and the remainder recovered. The loss of service was 383 days, or 54.71 for each case.

The digestive gave 2 cases of dysentery, chronica, 2 of hernia, and 1 of fistula in ano, being a reduction of 1 case as compared with last year. Single cases of hernia and dysentery were invalided. The loss of service amounted to 242 days.

Three cases made up the total of the genito-urinary diseases, which were of gonorrhœa, strictura, urethræ, and orchitis, and the latter was invalided. The loss of service was 166 days.

There were also 3 cases of skin disease, 1 of abscessus and 2 of ulcer. The loss of service was 92 days.

In the class of sickness from poisons, 1 case of delirium tremens was treated, which ended fatally.

Seven cases fell within the class of diseases from violence, the average duration of treatment of which was 24.57, giving a total loss of service of 172 days. The cases comprised, 3 of contusion, 1 of fracture, and 3 of wounds.

TABLE I.—*Showing the number admitted and discharged, number of sick days, average number of days under treatment, and the daily average number of sick in the naval hospitals.*

Hospitals.	Remaining from last year.	Admitted.					Discharged.				Continued.	Total number of sick days.	Average number of days under treatment.	Daily average number of sick.	
		First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Total treated.	Cured.	Invalided.		Total.					
								To hospital.	From service.						Died.
Chelsea, Mass.	43	72	34	46	72	267	160	6	26	5	197	70	13,205	49.45	36.17
Brooklyn, N. Y.	33	67	80	108	98	386	213	83	55	7	358	28	11,965	30.99	32.76
Philadelphia, Pa.	30	39	38	40	57	204	150	2	10	12	174	30	9,861	48.33	27.01
Washington, D. C.	12	48	29	26	35	150	121	2	7	2	132	18	5,294	35.29	14.50
Norfolk, Va.	34	38	52	31	78	233	140	9	29	7	185	48	13,652	58.59	37.40
Pensacola, Fla.	4	6	2	1	2	15	12	....	2	....	14	1	558	37.20	1.52
Mare Island, Cal.	15	24	71	31	32	173	98	...	40	2	140	33	8,380	48.43	22.95
Yokohama, Japan.	4	22	5	13	9	53	31	9	6	1	47	6	2,602	49.09	7.12
Total.....	175	316	311	296	383	1,481	925	111	175	36	1,247	234	65,517	44.23	179.49

TABLE II.—Showing the aggregate number of admissions, discharges and deaths, number of sick days, duration of treatment, and daily average number of sick at the naval hospitals.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						To hospital.	From service.		
A.—GENERAL DISEASES.									
I.—ZYMOTIC DISEASES.									
Catarrhus epidemicus.....	1	69	.18	69	1				
Erysipelas.....	11	266	.72	24.18	9	2			
Febricula.....	4	100	.27	25	4				
Febris continua simplex.....	8	174	.47	21.75	7			1	
Febris enterica.....	9	427	1.16	47.44	5		1	1	2
Febris intermittens.....	65	1,642	4.49	25.26	57	5		1	2
Febris remittens.....	30	1,262	3.45	42.06	24		1	1	4
Morbilli.....	8	263	.72	32.87	8				
Parotitis.....	1	32	.08	32	1				
Phagedæna putris.....	1	23	.06	23	1				
Scarlatina.....	6	364	.99	60.66	4			2	
Vaccina.....	1	28	.07	28	1				
Variola.....	2	83	.22	41.5	2				
Varioloides.....	4	173	.47	43.25	4				
Total.....	151	4,906	13.44	32.48	128	7	2	6	8
II.—CONSTITUTIONAL DISEASES.									
Adynamia.....	49	2,123	5.81	43.32	23	6	12	2	6
Anæmia.....	8	392	1.07	48.75	7			1	
Carcinoma.....	3	92	.25	30.66		1	1	1	
Diabetes.....	3	168	.46	56	1				2
Lumbago.....	5	181	.49	36.2	2	1			2
Podagra.....	1	71	.19	71	1				
Rheumatismus acutus.....	50	2,028	5.55	40.56	34	5	2		9
Rheumatismus chronicus.....	68	3,517	9.63	51.71	42	4	12	1	9
Scrofula.....	2	53	.14	26.5	2				
Senectus.....	6	1,455	3.98	242.5	1			1	4
Syphilis primitiva.....	49	1,980	5.42	40.40	33	5	1		10
Syphilis consecutiva.....	84	4,360	11.94	51.90	55	5	18		6
Total.....	328	16,420	44.98	50.06	201	27	46	6	48
B.—LOCAL DISEASES.									
I.—DISEASES OF THE NERVOUS SYSTEM.									
Apoplexia.....	1	74	.20	74	1				
Cephalalgia.....	3	35	.09	11.66	2			1	
Cerebritis.....	1	27	.07	27	1				
Chorea.....	1	99	.27	99	1				
Convulsio.....	1	237	.64	237					1
Dementia.....	8	458	1.25	57.25	2	2	1	1	2
Epilepsia.....	16	497	1.36	31.06	4	2	6		4
Hysteria.....	2	39	.10	19.5	2				
Insolatio.....	1	2		2	1				
Insomnia.....	3	48	.13	16	3				
Mania.....	11	246	.67	22.36	1	8	1		1
Melancholia.....	5	94	.25	18.8	1	1	2		1
Meningitis.....	4	102	.27	25.5	1	1	1		1
Neuralgia.....	22	1,081	2.96	49.13	15	1	5		1
Paralysis.....	18	1,462	3.99	81.22	4		6	4	4
Pleurodynia.....	2	37	.10	18.5	2				
Vertigo.....	1	6	.01	6			1		
Total.....	100	4,544	12.44	45.44	41	15	23	6	15
II.—DISEASES OF THE EYE.									
Amaurosis.....	4	233	.63	57.50	3		1		
Asthenopia.....	1	44	.12	44					1
Cataracta.....	2	199	.54	99.5	1				1
Conjunctivitis.....	8	230	.63	28.75	5		2		1
Choroiditis.....	1	19	.05	19					1
Iritis.....	6	327	.89	54.5	2		3		1
Ophthalmia.....	3	143	.39	47.66	2		1		
Ophthalmia tarsi.....	1	18	.04	18	1				

TABLE II.—Showing the aggregate number of admissions, &c.—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						From service.	To hospital.		
B.—LOCAL DISEASES—Continued.									
II.—DISEASES OF THE EYE—Continued.									
Retinitis	4	121	.33	30.25	1	1	1	.....	1
Stricture ducti lachrymalis	1	16	.04	16	.....	.....	.....	.....	1
Ulcer cornea	4	120	.32	30	4	.....	.....	.....	.....
Total	35	1,470	4.02	42	19	1	8	.....	7
III.—DISEASES OF THE EAR.									
Otalgia	1	59	.16	59	.....	.....	1	.....	.....
Otitis	3	50	.13	16.66	2	.....	1	.....	.....
Otorrhœa	4	219	.60	54.75	2	1	1	.....	.....
Surditas	4	140	.38	35	1	.....	2	.....	1
Total	12	468	1.28	39	5	1	5	.....	1
V.—DISEASES OF THE CIRCULATORY SYSTEM.									
Aneurysma	7	604	1.65	86.28	4	.....	1	.....	2
Angina pectoris	4	92	.25	23	2	1	1	.....	.....
Dilatatio cordis	3	259	.70	86.33	1	.....	.....	.....	2
Endocarditis	1	4	.01	4	.....	.....	.....	.....	1
Hypertrophica cordis	1	52	.14	52	1	.....	.....	.....	.....
Morbi valvularum cordis	14	975	2.67	69.64	5	.....	6	.....	3
Palpitatio	12	600	1.64	50	3	4	4	.....	1
Pericarditis	1	18	.04	18	.....	.....	1	.....	.....
Phlebitis	1	16	.04	16	1	.....	.....	.....	.....
Varix	4	255	.69	63.75	2	1	.....	.....	1
Total	48	2,875	7.87	59.89	19	6	13	.....	10
VI.—DISEASES OF THE RESPIRATORY SYSTEM.									
Asthma	9	586	1.60	65.11	5	...	2	1	1
Bronchitis acuta	26	933	2.55	35.88	13	.....	.....	.....	13
Bronchitis chronica	32	1,735	4.75	54.21	17	1	6	.....	8
Catarrhus	9	887	2.43	98.55	2	1	2	.....	4
Emphysema	1	20	.05	20	.....	1	.....	.....	.....
Epistaxis	1	9	.02	9	1	.....	.....	.....	.....
Hæmoptysis	3	184	.50	61.46	2	.....	.....	.....	1
Laryngitis	7	136	.37	19.42	5	.....	.....	.....	2
Phthisis pneumonica acuta	6	349	.95	58.16	.....	1	4	.....	1
Phthisis pneumonica chronica	42	2,948	8.07	70.19	10	3	12	6	11
Pleuritis	18	719	1.96	39.94	6	4	2	.....	6
Pneumonia	19	788	2.15	41.47	9	1	2	5	2
Total	173	9,294	25.46	53.72	70	12	30	12	49
VII.—DISEASES OF THE DIGESTIVE SYSTEM.									
Ascites	2	129	.35	64.5	1	.....	.....	1	.....
Cholera morbus	2	23	.06	11.5	.....	1	.....	1	.....
Cirrhosis hepatis	2	38	.10	19	2	.....	.....	.....	.....
Constipatio	6	216	.59	36	5	1	.....	.....	.....
Diarrhœa acuta	20	648	1.77	64.80	15	3	.....	.....	2
Diarrhœa chronica	5	171	.46	34.2	3	.....	1	.....	1
Dysenteria acuta	5	158	.43	31.6	4	1	.....	.....	.....
Dysenteria chronica	9	258	.70	28.66	5	1	1	.....	2
Dyspepsia	25	726	1.98	29.04	15	4	3	1	2
Enteritis	5	253	.69	50.6	4	.....	.....	.....	1
Fistula in ano	8	404	1.10	50.5	6	.....	.....	.....	2
Gastritis	1	16	.04	16	.....	1	.....	.....	.....
Gastrodynia	1	17	.04	17	1	.....	.....	.....	.....
Hæmorrhoids	15	689	1.83	46.66	9	.....	3	.....	3
Hepatitis	1	12	.03	12	1	.....	.....	.....	.....
Hepatitis chronica	3	90	.24	30	1	1	1	.....	.....
Hernia	30	893	2.44	29.76	12	4	12	.....	2
Icterus	7	639	1.21	91.28	5	.....	.....	.....	2

TABLE II.—*Naval Hospitals*—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided			
						To hospital.	From service.	Number died.	Number continued.
B.—LOCAL DISEASES—Continued.									
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.									
Peritonitis	2	13	.03	6.5	1	.....	.....	.....	1
Pharyngitis	1	11	.03	11	1	.....	.....	.....	.....
Prolapsus ani	2	55	.15	27.5	1	.....	.....	.....	1
Tonsillitis	12	392	1.07	32.66	10	.....	.....	.....	2
Verues	4	110	.30	27.5	3	.....	.....	.....	1
Total	168	5,961	16.33	35.48	105	17	21	3	22
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.									
Albuminuria	10	688	1.88	68.80	6	.....	1	1	2
Calculus	1	77	.21	77	1	.....	.....	.....	.....
Chaneroides	20	1,074	2.94	53.7	13	1	1	.....	5
Cystitis	11	744	2.03	67.63	7	.....	2	.....	2
Dysuria	2	98	.24	49	2	.....	.....	.....	.....
Enuresis	3	91	.21	30.33	1	.....	2	.....	.....
Gonorrhœa	37	1,583	4.33	42.78	32	2	.....	.....	3
Hæmaturia	1	17	.04	17	1	.....	.....	.....	.....
Hydrocele	5	127	.34	25.4	3	.....	.....	.....	2
Nephritis	7	443	1.21	63.28	4	.....	1	.....	2
Orchitis	25	1,277	3.49	51.08	14	2	4	.....	5
Phymosis	3	125	.34	41.83	2	.....	.....	.....	1
Prostatitis	1	14	.03	14	1	.....	.....	.....	.....
Urethræ strictura	18	1,102	3.01	61.22	10	1	2	.....	5
Varicocele	1	46	.12	46	1	.....	.....	.....	.....
Total	145	7,506	20.56	51.76	97	7	13	1	27
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.									
Arthritis	1	19	.05	19	1	.....	.....	.....	.....
Ankylosis	2	138	.37	69	1	.....	1	.....	.....
Caries	1	52	.14	52	.....	.....	.....	.....	1
Necrosis	2	68	.18	34	.....	1	.....	.....	1
Ostitis	2	83	.22	41.5	.....	.....	1	.....	1
Periostitis	2	46	.12	23	1	1	.....	.....	.....
Synovitis	7	290	.79	41.42	4	.....	.....	.....	3
Total	17	696	1.90	40.94	7	2	2	.....	6
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.									
Abscessus	26	1,590	4.35	61.15	18	2	.....	.....	6
Acne	2	35	.09	17.5	1	.....	1	.....	.....
Anthrax	1	165	.45	165	1	.....	.....	.....	.....
Epithelioma	1	24	.06	24	1	.....	.....	.....	.....
Eczema	5	394	1.07	78.8	3	1	.....	.....	1
Furunculus	2	86	.23	43	2	.....	.....	.....	.....
Herpes	2	78	.21	39	2	.....	.....	.....	.....
Impetigo	2	61	.16	30.5	1	.....	.....	.....	1
Lichen	1	23	.06	23	1	.....	.....	.....	.....
Onychia	1	48	.13	48	1	.....	.....	.....	.....
Paronychia	3	184	.50	61.33	2	1	.....	.....	.....
Prurigo	1	12	.03	12	1	.....	.....	.....	.....
Psoriasis	2	59	.16	29.5	1	1	.....	.....	.....
Scabies	32	512	1.40	16	32	.....	.....	.....	.....
Tinea	1	47	.12	47	1	.....	.....	.....	.....
Unguis involutis	1	50	.13	50	1	.....	.....	.....	.....
Ulcus	18	756	2.07	42	9	.....	2	.....	7
Urticaria	1	47	.12	47	1	.....	.....	.....	.....
Verruca	1	13	.03	13	1	.....	.....	.....	.....
Total	103	4,184	11.46	40.62	80	5	3	.....	15

TABLE II.—*Naval Hospitals*—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						To hospital.	From service.		
B.—LOCAL DISEASES—Continued.									
XI.—DISEASES OF THE ABSORBENT SYSTEM.									
Adenitis	33	1, 824	4. 99	55. 27	26	1	.....	.....	6
XII.—NON-MALIGNANT TUMORS AND CYSTS.									
Adenoma	2	20	. 05	10	2	.....	.....	.....	.....
Fibroma	1	38	. 10	38	1	.....	.....	.....	.....
Polypus	1	23	. 06	23	.....	.....	.....	.....	1
Sarcoma	1	77	. 21	77	1	.....	.....	.....	.....
Total	5	158	. 43	31. 6	4	.....	.....	.....	1
C.—POISONS.									
Alcoholismus	25	430	1. 17	17. 2	24	1	.....	.....	.....
Colica pictonum	1	10	. 02	10	1	.....	.....	.....	.....
Delirium tremens	7	38	. 10	5. 42	6	.....	.....	1	.....
Ebriositas	8	26	. 07	3. 25	8	.....	.....	.....	.....
Total	41	504	1. 38	12. 29	39	1	.....	1	.....
D.—VIOLENT DISEASES AND DEATHS.									
Abrasio	1	7	. 01	7	1	.....	.....	.....	.....
Ambustio	2	60	. 16	30	2	.....	.....	.....	.....
Concussio cerebri	3	73	. 20	24. 33	2	1	.....	.....	.....
Congelatio	3	81	. 22	27	2	.....	.....	.....	1
Contusio	21	382	1. 04	19. 18	16	1	.....	.....	4
Fractura	24	1, 930	5. 28	56. 76	21	4	3	.....	6
Luxatio	5	174	. 47	34. 8	3	.....	2	.....	.....
Stemma	28	1, 046	2. 86	37. 35	21	2	2	.....	3
Submersio	1	1	.....	1	.....	.....	.....	1	.....
Vulnus contusum	5	104	. 28	20. 8	2	.....	.....	.....	3
Vulnus incisum	3	56	. 15	18. 66	2	.....	.....	.....	1
Vulnus laceratum	11	415	1. 13	37. 72	8	1	1	.....	1
Vulnus sclopetarium	4	224	. 61	56	3	.....	1	.....	.....
Cicatrix memb. trunc. irrital	1	154	. 42	154	1	.....	.....	.....	.....
Total	122	4, 707	12. 89	38. 58	84	9	9	1	19
Grand total	1, 481	65, 517	179. 49	44. 23	925	111	175	36	234

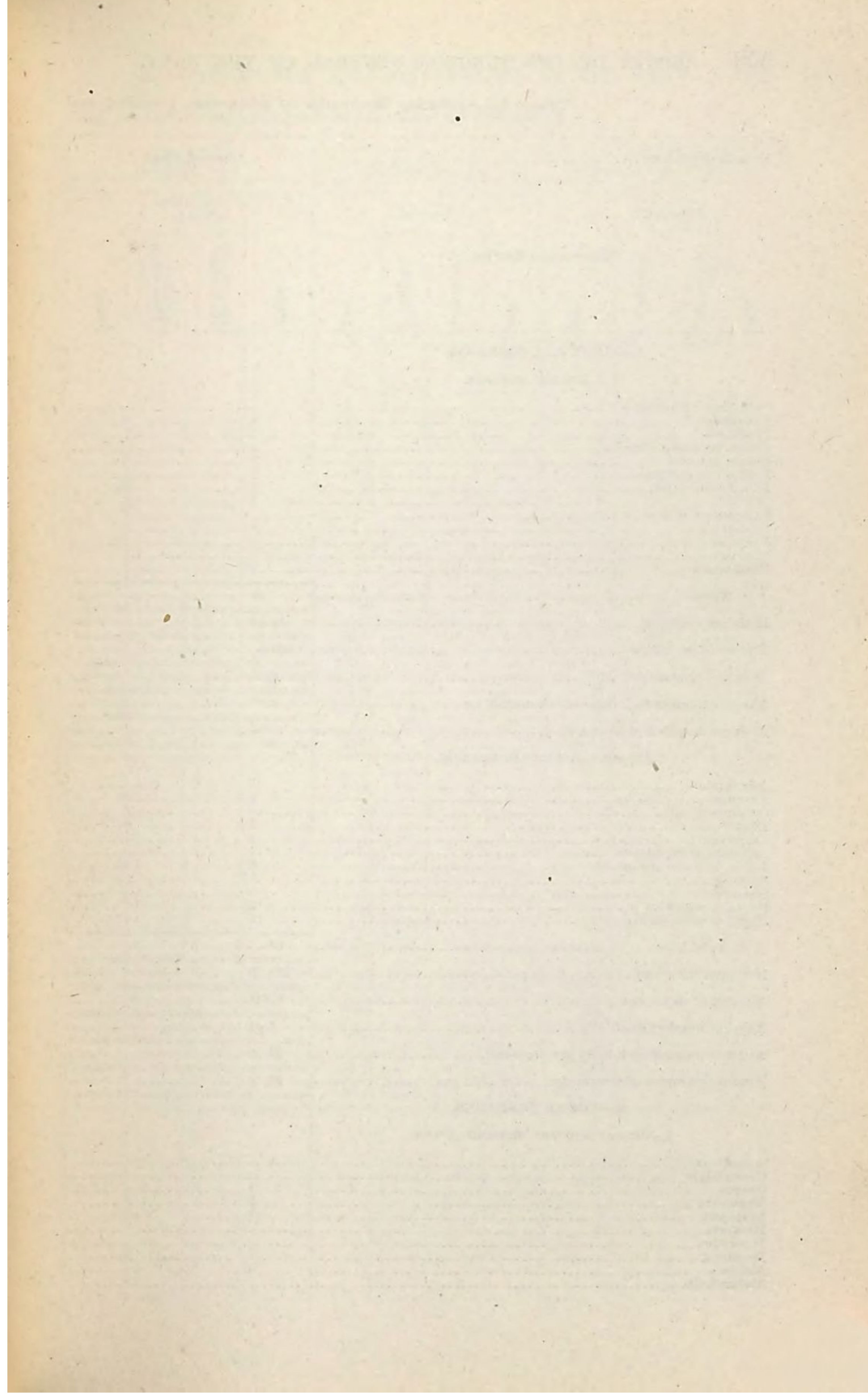


TABLE III.—*Showing the number of admissions, invalided, and*

Vessels or stations	Chelsea, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
A.—GENERAL DISEASES.				
I.—ZYMOTIC DISEASES.				
Catarrhus epidemicus				
Erysipelas	3			
Febricula	1			
Febris continua simplex	2			
Febris enterica	2			
Febris intermittens	2			
Febris remittens	3			
Morbilli	1			
Phagedæna putris				
Scarlatina	5			2
Vaccina				
Variola				
Varioloides				
Total	19			2
Ratio per thousand	71.16			7.49
Number of sick days	854			
Average number sick daily	2.33			
Average number sick daily per thousand	8.95			
Average duration of treatment	44.94			
II.—CONSTITUTIONAL DISEASES.				
Adynamia	11	1	2	
Anæmia	2			1
Carcinoma				
Diabetes	2			
Lumbago	1			
Rheumatismus acutus	10	1		
Rheumatismus chronicus	6		1	
Scrofula	1			
Senectus	1			
Syphilis primitiva	14		1	
Syphilis consecutiva	15		1	
Total	63	2	5	1
Ratio per thousand	235.95	7.49	18.72	3.74
Number of sick days	2,848			
Average number sick daily	7.81			
Average number sick daily per thousand	29.25			
Average duration of treatment	45.20			
B.—LOCAL DISEASES.				
I.—DISEASES OF THE NERVOUS SYSTEM.				
Apoplexia				
Cephalalgia				
Chorea	1			
Dementia	2			
Epilepsia	1		1	
Hysteria				
Insolatio				
Insomnia				
Mania	5	3	1	
Melancholia				

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Chelsea, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
I.—DISEASES OF THE NERVOUS SYSTEM—Continued.				
Meningitis	1		1	
Neuralgia	1			
Paralysis				
Pleurodynia				
Total	11	3	3	
Ratio per thousand	41.20	11.23	11.23	
Number of sick days	724			
Average number sick daily	1.98			
Average number sick daily per thousand	7.41			
Average duration of treatment	65.81			
II.—DISEASES OF THE EYE.				
Amaurosis	1		1	
Asthenopia	1			
Cataracta				
Conjunctivitis	3		1	
Choroiditis				
Iritis	1			
Ophthalmia				
Ophthalmia tarsi	1			
Retinitis				
Ulcus corneæ	1			
Total	8		2	
Ratio per thousand	29.96		7.49	
Number of sick days	327			
Average number sick daily	.89			
Average number sick daily per thousand	3.33			
Average duration of treatment	40.87			
III.—DISEASES OF THE EAR.				
Otitis	3		1	
Otorrhœa				
Surditas	1		1	
Total	4		2	
Ratio per thousand	14.98		7.49	
Number of sick days	119			
Average number sick daily	.32			
Average number sick daily per thousand	1.19			
Average duration of treatment	29.75			
IV.—DISEASES OF THE CIRCULATORY SYSTEM.				
Aneurysma	2			
Angina pectoris				

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Chelsea, Mass.			
	Cases.	Invalided.		Dead.
		To hospital.	From service.	
Diseases and injuries.				
B—LOCAL DISEASES—Continued.				
V.—DISEASES OF THE CIRCULATORY SYSTEM—Continued.				
Dilatatio cordis				
Endocarditis				
Hypertrophica cordis				
Morbi valvularum cordis	2		2	
Palpitatio	2		1	
Pericarditis				
Phlebitis				
Varix				
Total	6		3	
Ratio per thousand	22.46		11.23	
Number of sick days	523			
Average number sick daily	1.43			
Average number sick daily per thousand	5.35			
Average duration of treatment	87.16			
VI.—DISEASES OF THE RESPIRATORY SYSTEM.				
Asthma				
Brönchitis acuta	18			
Brönchitis chronica	11		1	
Catarrhus	1			
Epistaxis	1			
Hæmoptysis				
Laryngitis				
Phthisis pneumonica acuta	1		1	
Phthisis pneumonica chronica	11	1	4	1
Pleuritis	3			
Pneumonia	1			1
Total	47	1	6	2
Ratio per thousand	176.02	3.74	22.46	7.49
Number of sick days	2,416			
Average number sick daily	6.61			
Average number sick daily per thousand	24.75			
Average duration of treatment	51.40			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.				
Ascites				
Cholera morbus				
Cirrhosis hepatis				
Constipatio				
Diarrhœa acuta	1			
Diarrhœa chronica	1			
Dysenteria acuta				
Dysenteria chronica	1			
Dyspepsia	2			
Enteritis				
Fistula in ano	3			
Gastritis				
Gastrodynia				
Hæmorrhoids	1			
Hepatitis acuta				
Hepatitis chronica				
Hernia	2		1	
Icterus				
Peritonitis	1			

for each disease, and injury at the several naval hospitals—Continued.

Brooklyn, N. Y.				Philadelphia, Pa.				Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1								2			
1											
5		2						2			
6	4	1									
1		1									
1											
1	1							2			
19	6	5		1				6			
49.21	15.54	12.95		4.90				40			
461				2				476			
1.20								1.30			
3.10								8.66			
24.26				2				79.33			
3		2		3			1				
6	1	2		2				2			
1	1			2				5			
1											
1				1				1			
2	1	1		1							
6		1	1	3			1	5		1	2
4	2	1						2			
3			3	5				4		1	
27	5	7	4	19			2	19		2	2
69.94	12.95	18.13	10.37	93.14			9.80	126.66		13.33	13.33
713				1,552				720			
1.95				4.25				1.97			
5.05				20.83				13.13			
26.40				81.68				37.89			
1			1								
1	1										
3	1			2							
8	3			4				1			
2		1						1			
1	1			1				1			
9	3	2		1		1		1			
3				7			1				
1				1							
1	1			1				1			
3		1		4							
1											
2	1										
14	3	5		4				2			
				2				2			
				1							

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Chelsea, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.				
Pharyngitis				
Prolapsus ani				
Tonsillitis	4			
Vermes	2			
Total	18		1	
Ratio per thousand	67.42		3.74	
Number of sick days	695			
Average number sick daily	1.90			
Average number sick daily per thousand	7.11			
Average duration of treatment	38.61			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.				
Albuminuria	1			
Chancroides	1			
Cystitis	1			
Enuresis	1			
Gonorrhœa	13			
Hæmaturia				
Hydrocele	4			
Nephritis				
Orchitis	4		2	
Phymosis	1			
Prostatitis	1			
Urethræ strictura	5		1	
Varicocele				
Total	32		3	
Ratio per thousand	119.85		11.23	
Number of sick days	2,130			
Average number sick daily	5.83			
Average number sick daily per thousand	21.85			
Average duration of treatment	66.56			
VIII.—DISEASES OF THE LOCOMOTIVE SYSTEM.				
Ankylosis	1		1	
Caries				
Necrosis				
Ostitis	1			
Periostitis				
Synovitis	1			
Total	3		1	
Ratio per thousand	11.23		3.74	
Number of sick days	275			
Average number sick daily	.75			
Average number sick daily per thousand	2.83			
Average duration of treatment	91.66			

for each disease and injury, at the several naval hospitals—Continued.

Brooklyn, N. Y.				Philadelphia, Pa.				Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1											
1											
3								4			
2											
56	14	9	1	29	1	1		14			
14.507	36.26	23.32	2.59	142.15	4.90	4.90		93.33			
1,401				1,058				319			
3.83				2.89				.87			
9.92				14.16				5.8			
25.01				36.48				22.78			
5		1	1	3				1			
2				2				4			
				1	1			2			
9	2			2				5			
								1			
1		1		2				1			
13	2			1				1			
1								3	1		
5	1			1							
1	1										
37	6	2	1	12	1			18	1		
95.85	15.54	5.18	2.59	58.82	4.90			120	6.66		
1,034				617				656			
2.83				1.69				1.79			
7.33				8.28				11.93			
27.94				51.41				36.44			
1								1			
2	1										
1		1									
2	1										
3				1							
9	2	1		1				1			
23.32	5.18	2.59		4.90				6.66			
214				88				52			
.58				.24				.14			
1.50				1.17				.93			
23.77				88				52			

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Chelsea, Mass.		
Diseases and injuries.	Cases.	Invalided.	
		To hospital.	From service.
Dead.			
B.—LOCAL DISEASES—Continued.			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.			
Abscessus	2		
Acne			
Epithelioma	1		
Eczema	1		
Furunculus	1		
Herpes			
Impetigo	1		
Lichen			
Onychia			
Paronychia	1		
Prurigo	1		
Psoriasis	1		
Scabies	19		
Tinea	1		
Unguis involutis	1		
Ulcus	4		
Urticaria			
Total	34		
Ratio per thousand	127.34		
Number of sick days	1,171		
Average number sick daily	3.20		
Average number sick daily per thousand	11.98		
Average duration of treatment	31.5		
XI.—DISEASES OF THE ABSORBENT SYSTEM.			
Adenitis	3		
Total	3		
Ratio per thousand	11.23		
Number of sick days	205		
Average number sick daily	.56		
Average number sick daily per thousand	2.09		
Average duration of treatment	68.33		
XII.—NON-MALIGNANT TUMORS AND CYSTS.			
Adenoma			
Polypus	1		
Sarcoma			
Total	1		
Ratio per thousand	3.74		
Number of sick days	23		
Average number sick daily	.06		
Average number sick daily per thousand	.22		
Average duration of treatment	23		

for each disease and injury, at the several naval hospitals—Continued.

Brooklyn, N. Y.				Philadelphia, Pa.				Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
9	2			3							
2		1									
1	1			1				1			
2								1			
1											
1	1										
1	1										
5		1		1							
23	5	2		6				3			
59.27	12.95	5.18		29.50				20			
860				376				32			
2.35				1.03				.08			
6.08				5.04				.53			
37.39				62.66				10.66			
4	1			2				7			
4	1			2				7			
10.37	2.59			9.80				46.66			
193				53				450			
.52				.14				1.23			
1.34				.68				8.2			
48.25				26.5				64.28			
1								1			
1											
2								1			
5.18								6.66			
87								10			
.23								.02			
.59								.13			
43.5								10			

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Chelsea, Mass.			
	Cases.	Invalided.		Dead.
		To hospital.	From service.	
Diseases and injuries.				
C.—POISONS.				
Alcoholismus	1			
Delirium tremens	1			
Ebriositas				
Total	2			
Ratio per thousand	7.49			
Number of sick days	14			
Average number sick daily	.03			
Average number sick daily per thousand	.11			
Average duration of treatment	7			
D.—VIOLENT DISEASES AND DEATHS.				
Ambustio				
Concussio cerebri				
Congelatio	1			
Contusio				
Fractura	8			
Luxatio	1			
Stremma	3			
Vulnus contusum	3			
Vulnus incisum				
Vulnus laceratum				
Vulnus sclopetarium				
Total	16			
Ratio per thousand	59.93			
Number of sick days	881			
Average number sick daily	2.41			
Average number sick daily per thousand	9.02			
Average duration of treatment	55.06			
Grand total	267	6	26	5
Ratio per thousand	1,000	22.46	97.37	18.72
Number of sick days	13,205			
Average number sick daily	36.17			
Average number sick daily per thousand	135.46			
Average duration of treatment	49.45			

for each disease and injury, at the several naval hospitals—Continued.

Brooklyn, N. Y.				Philadelphia, Pa.				Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
3	1	.....	.....	19	.....	.....	.....	2	.....	.....	.....
.....	.....	.....	.....	3	.....	.....	.....	2	.....	.....	.....
.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....
3	1	.....	.....	30	.....	.....	.....	4	.....	.....	.....
7.77	2.59	.....	.....	147.05	.....	.....	.....	26.66	.....	.....	.....
66	.....	.....	.....	380	.....	.....	.....	33	.....	.....	.....
.18	.....	.....	.....	1.04	.....	.....	.....	.09	.....	.....	.....
.46	.....	.....	.....	5.09	.....	.....	.....	.60	.....	.....	.....
22	.....	.....	.....	12.66	.....	.....	.....	8.25	.....	.....	.....
1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
5	1	.....	.....	4	.....	.....	.....	2	.....	.....	.....
10	3	.....	.....	5	.....	.....	.....	1	.....	1	.....
1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
10	.....	1	.....	2	.....	.....	.....	8	.....	1	.....
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	1	.....	.....	1	.....	.....	.....	3	.....	.....	.....
.....	.....	.....	.....	2	.....	1	.....	2	.....	.....	.....
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
32	6	1	.....	18	.....	1	.....	17	.....	2	.....
82.89	15.54	2.59	.....	88.23	.....	4.90	.....	133.33	.....	13.33	.....
883	.....	.....	.....	727	.....	.....	.....	627	.....	.....	.....
2.41	.....	.....	.....	1.99	.....	.....	.....	1.71	.....	.....	.....
6.24	.....	.....	.....	9.75	.....	.....	.....	11.4	.....	.....	.....
27.59	.....	.....	.....	40.38	.....	.....	.....	36.88	.....	.....	.....
386	83	55	7	204	2	10	12	150	2	7	2
1,000	215.02	142.48	18.13	1,000	9.80	49.01	58.82	1,000	13.33	46.66	13.33
11,965	.....	.....	.....	9,861	.....	.....	.....	5,294	.....	.....	.....
32.76	.....	.....	.....	27.01	.....	.....	.....	14.50	.....	.....	.....
84.87	.....	.....	.....	132.40	.....	.....	.....	96.66	.....	.....	.....
30.99	.....	.....	.....	48.33	.....	.....	.....	35.29	.....	.....	.....

TABLE III.—*Showing the number of admissions, invalided, and dead*

Vessels or stations.....	Norfolk, Va.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
A.—GENERAL DISEASES.				
I.—ZYMOTIC DISEASES.				
Febricula	3			
Febris continua simplex.....	1			
Febris enterica	1			1
Febris intermittens.....	12			1
Febris remittens.....	13		1	1
Morbilli	1			
Parotitis	1			
Scarlatina				
Variola.....	1			
Varioloides.....	3			
Total.....	36		1	3
Ratio per thousand.	154.50		4.29	12.87
Number of sick days.....	1,487			
Average number sick daily	4.07			
Average number sick daily per thousand.....	17.46			
Average duration of treatment	41.30			
II.—CONSTITUTIONAL DISEASES.				
Adynamia.....	9	1	4	
Anæmia.....	1			
Lumbago				
Podagra	1			
Rheumatismus acutus	9			
Rheumatismus chronicus.....	12	1	1	
Syphilis primitiva	9			
Syphilis consecutiva.....	8		1	
Total.....	49	2	6	
Ratio per thousand.....	210.30	8.59	25.75	
Number of sick days.....	3,273			
Average number sick daily	8.96			
Average number sick daily per thousand.....	38.45			
Average duration of treatment.....	66.79			
B.—LOCAL DISEASES.				
I.—DISEASES OF THE NERVOUS SYSTEM.				
Cephalalgia	2			1
Cerebritis	1			
Convulsio.....				
Dementia				
Epilepsia.....	1		1	
Hysteria				
Insomnia.....	1			
Mania				
Melancholia.....	1	1		
Meningitis	1			
Neuralgia.....	3		1	
Paralysis.....				
Vertigo				
Total.....	10	1	2	1

for each disease and injury, at the several naval hospitals—Continued.

Pensacola, Fla.				Mare Island, Cal.				Yokohama, Japan.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1				1			1				
				1		1					
				1							
				6				1			
				4							
				1							
1				14		1	1	1			
66.66				80.92		5.77	5.77	18.86			
13				643				33			
.03				1.76				.09			
2				10.17				1.73			
13				45.92				33			
				4		1		1			
1											
				4		2		2			
				6		2		3			
1		1		3				1			
				19		7		7		2	
2		1		36		12		14		2	
133.33		66.66		208.09		69.36		264.15		37.73	
106				1,813				741			
.29				4.96				1.03			
19.33				28.61				19.43			
53				50.36				52.92			
				1							
				2		1					
				3		1		1		1	
				1							
				1							
				1				1		1	
				2		1					
				6		2		3		1	
								1		1	
				1		1					
				18		6		6		2	
										2	

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Norfolk, Va.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
I.—DISEASES OF THE NERVOUS SYSTEM—Continued.				
Ratio per thousand	42. 91	4. 29	8. 58	4. 29
Number of sick days	276			
Average number sick daily	. 75			
Average number sick daily per thousand	3. 21			
Average duration of treatment	27. 6			
II.—DISEASES OF THE EYE.				
Conjunctivitis	1			
Iritis				
Ophthalmia				
Retinitis	1			
Strictura ducti lachrymalis				
Ulcus cornea	2			
Total	4			
Ratio per thousand	17. 16			
Number sick days	90			
Average number sick daily	. 24			
Average number sick daily per thousand	1. 03			
Average duration of treatment	22. 5			
III.—DISEASES OF THE EAR.				
Otalgia	1		1	
Otorrhœa	1			
Surditas				
Total	2		1	
Ratio per thousand	8. 59		4. 29	
Number of sick days	139			
Average number sick daily	. 38			
Average number sick daily per thousand	1. 63			
Average duration of treatment	69. 5			
IV.—DISEASES OF THE CIRCULATORY SYSTEM.				
Aneurysma	1			
Angina pectoris	1			
Dilatatio cordis				
Morbi valvularum cordis	3		1	
Palpitatio	2			
Varix				
Total	7		1	
Ratio per thousand	30. 03		4. 29	
Number of sick days	783			

for each disease and injury, at the several naval hospitals—Continued.

Pensacola, Fla.				Mare Island, Cal.				Yokohama, Japan.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....				104.04	.....	34.68	.....	113.20	37.73	37.73	.....
.....				630	.....	.....	.....	355	.....	.....	.....
.....				1.72	.....	.....	.....	.97	.....	.....	.....
.....				9.94	.....	.....	.....	18.30	.....	.....	.....
.....				35	.....	.....	.....	58.33	.....	.....	.....
.....				3	.....	1	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	1	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				6	.....	1	.....	1	.....	.....	.....
.....				34.68	.....	5.78	.....	18.86	.....	.....	.....
.....				256	.....	.....	.....	93	.....	.....	.....
.....				.70	.....	.....	.....	.25	.....	.....	.....
.....				4.04	.....	.....	.....	4.71	.....	.....	.....
.....				42.6	.....	.....	.....	93	.....	.....	.....
.....											
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				8	.....	.....	.....	.....	.....	.....	.....
.....				.02	.....	.....	.....	.....	.....	.....	.....
.....				11	.....	.....	.....	.....	.....	.....	.....
.....				8	.....	.....	.....	.....	.....	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	1	.....	1	.....	.....	.....
.....				2	.....	1	.....	1	.....	.....	.....
.....				1	.....	1	.....	1	.....	1	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				7	.....	3	.....	2	.....	1	.....
.....				40.46	.....	17.34	.....	37.73	.....	18.86	.....
.....				501	.....	.....	.....	129	.....	.....	.....

TABLE III.—Showing the number of admissions, the invalided, and dead,

Vessels or stations	Norfolk, Va.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
V.—DISEASES OF THE CIRCULATORY SYSTEM—Continued.				
Average number sick daily .....	.....	.....	.....	.....
Average number sick daily per thousand .....	.....	.....	.....	.....
Average duration of treatment	111.85	.....	.....	.....
VI.—DISEASES OF THE RESPIRATORY SYSTEM.				
Asthma	1	.....	.....	.....
Bronchitis acuta	2	.....	.....	.....
Bronchitis chronica	7	.....	2	.....
Catarrhus	4	.....	2	.....
Emphysema .....	.....	.....	.....	.....
Hæmoptysis	1	.....	.....	.....
Laryngitis	1	.....	.....	.....
Phthisis pneumonica acuta	1	.....	1	.....
Phthisis pneumonica chronica	3	.....	.....	.....
Pleuritis	2	1	.....	.....
Pneumonia	2	.....	.....	1
Total	24	1	5	1
Ratio per thousand	103.01	4.29	21.44	4.29
Number of sick days	1,431	.....	.....	.....
Average number sick daily	3.92	.....	.....	.....
Average number sick daily per thousand	16.82	.....	.....	.....
Average duration of treatment	59.62	.....	.....	.....
VII.—DISEASES OF THE DIGESTIVE SYSTEM.				
Ascites .....	.....	.....	.....	.....
Cholera morbus	1	.....	.....	.....
Constipatio	1	.....	.....	.....
Diarrhœa acuta	6	.....	.....	.....
Diarrhœa chronica .....	.....	.....	.....	.....
Dysenteria acuta	1	.....	.....	.....
Dysenteria chronica	1	.....	.....	.....
Dyspepsia	6	1	.....	.....
Enteritis	1	.....	.....	.....
Fistula in ano	1	.....	.....	.....
Hæmorrhoids	4	.....	1	.....
Hepatitis chronica	1	.....	1	.....
Hernia	2	.....	2	.....
Icterus	1	.....	.....	.....
Prolapsus ani	1	.....	.....	.....
Tonsillitis	1	.....	.....	.....
Total	28	1	4	1
Ratio per thousand	120.17	4.29	17.16	4.29
Number of sick days	1,558	.....	.....	.....
Average number sick daily	4.26	.....	.....	.....
Average number sick daily per thousand	18.28	.....	.....	.....
Average duration of treatment	54.21	.....	.....	.....
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.				
Calculus	1	.....	.....	.....
Chancroides	12	1	1	.....
Cystitis	5	.....	2	.....
Dysuria	2	.....	.....	.....
Enuresis .....	.....	.....	.....	.....

for each disease and injury, at the several naval hospitals—Continued.

Pensacola, Fla.				Mare Island, Cal.				Yokohama, Japan.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....				1.37	.....	.....	.....	.35	.....	.....	.....
.....				7.91	.....	.....	.....	6.60	.....	.....	.....
.....				71.57	.....	.....	.....	64.5	.....	.....	.....
.....											
1				1	.....	.....	.....	.....	.....	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	1	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
1								1	1	.....	.....
.....											
.....				3	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	1	.....	.....	.....	.....	.....
.....				12	.....	6	1	2	2	.....	.....
.....				4	.....	1	.....	3	1	.....	.....
.....				3	.....	1	.....	1	1	.....	.....
2				28	.....	10	1	7	5	.....	.....
133.33				161.85	.....	57.80	5.78	132.07	94.33	.....	.....
210				1,869	.....	.....	.....	383	.....	.....	.....
.57				5.12	.....	.....	.....	1.04	.....	.....	.....
38				29.59	.....	.....	.....	19.62	.....	.....	.....
105				66.75	.....	.....	.....	54.71	.....	.....	.....
.....											
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....
1											
.....				3	.....	.....	.....	2	1	.....	.....
.....				1	.....	1	.....	.....	.....	.....	.....
.....											
2		1	.....	1	.....	.....	.....	1	.....	.....	.....
.....											
.....				4	.....	4	.....	2	1	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....
.....											
3		1	.....	15	.....	5	.....	5	2	.....	.....
200		66.66	.....	86.70	.....	28.90	.....	94.33	37.73	.....	.....
138				550	.....	.....	.....	242	.....	.....	.....
.37				1.50	.....	.....	.....	.66	.....	.....	.....
24.66				8.67	.....	.....	.....	12.45	.....	.....	.....
46				36.66	.....	.....	.....	48.4	.....	.....	.....
.....											
1											
.....				1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	1	.....	.....	.....	.....	.....

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Norfolk, Va.			
	Cases.	Invalided.		Dead.
		To hospital.	From service.	
Diseases and injuries.				
B.—LOCAL DISEASES—Continued.				
VII.—DISEASES OF THE GENITO-URINARY SYSTEM—Continued.				
Gonorrhœa	5			
Nephritis	1			
Orchitis	2			
Phymosis	1			
Urethræ strictura	6		1	
Total	35	1	4	
Ratio per thousand	50.21	4.29	17.16	
Number of sick days	2,373			
Average number sick daily	6.50			
Average number sick daily per thousand	27.89			
Average duration of treatment	67.8			
VIII.—DISEASES OF THE LOCOMOTIVE SYSTEM.				
Arthritis				
Synovitis	1			
Total	1			
Ratio per thousand	4.29			
Number of sick days	40			
Average number sick daily	.10			
Average number sick daily per thousand	.42			
Average duration of treatment	40			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.				
Abscessus	5			
Anthrax	1			
Eczema	1			
Impetigo	1			
Paronychia				
Scabies				
Ulcer	3		1	
Verruca				
Total	11		1	
Ratio per thousand	47.20		4.29	
Number of sick days	894			
Average number sick daily	2.44			
Average number sick daily per thousand	10.47			
Average duration of treatment	81.27			
XI.—DISEASES OF THE ABSORBENT SYSTEM.				
Adenitis	7			
Total	7			

for each disease and injury, at the several naval hospitals—Continued.

Pensacola, Fla.				Mare Island, Cal.				Yokohama, Japan.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
				2				1			
				2							
				1				1		1	
								1			
1				7		1		3		1	
66.66				40.46		5.77		56.60		18.86	
1				530				166			
				1.45				.45			
				8.38				8.49			
1				75.71				55.33			
				1							
				1							
				2							
				11.55							
				27							
				.07							
				.40							
				23.77							
1				5				1			
				1							
				12							
				3				2			
1											
2				21				3			
133.33				121.38				56.60			
40				719				92			
.10				1.96				.25			
6.66				11.32				4.71			
20				34.23				30.66			
				7				3			
				7				3			

TABLE III.—*Showing the number of admissions, invalided, and dead*

Vessels or stations	Norfolk, Va.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
B.—LOCAL DISEASES—Continued.				
XI.—DISEASES OF THE ABSORBENT SYSTEM—Continued.				
Ratio per thousand.....	30.03			
Number of sick days	318			
Average number sick daily	.87			
Average number sick daily per thousand	3.73			
Average duration of treatment.....	45.42			
XII.—NON-MALIGNANT TUMORS AND CYSTS.				
Fibroma	1			
Total	1			
Ratio per thousand.....	4.29			
Number of sick days	38			
Average number sick daily	.10			
Average number sick daily per thousand.....	.42			
Average duration of treatment.....	.38			
C.—POISONS.				
Colica pictonum.....				
Delirium tremens				
Total.....				
Ratio per thousand.....				
Number of sick days				
Average number sick daily				
Average number sick daily per thousand.....				
Average duration of treatment				
D.—VIOLENT DISEASES AND DEATHS.				
Abrasio	1			
Concussio cerebri	1			
Congelatio	1			
Contusio	3			
Fractura	4	1	2	
Luxatio	1		1	
Stremma	4	2		
Submersio	1			1
Vulnus contusum				
Vulnus incisum	1			
Vulnus laceratum.....				
Vulnus sclopetarium	1		1	
Total	18	3	4	1
Ratio per thousand.....	77.25	12.87	17.16	4.29
Number of sick days	953			

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Norfolk, Va.			
Diseases and injuries.	Cases.	Invalided.		Dead.
		To hospital.	From service.	
D.—VIOLENT DISEASES AND DEATHS--Continued.				
Average number sick daily	2. 61	.....	.....	.....
Average number sick daily per thousand.....	11. 20	.....	.....	.....
Average duration of treatment.....	52. 94	.....	.....	.....
Grand total	233	9	29	7
Ratio per thousand.....	1, 000	38. 61	124. 46	30. 03
Number of sick days	13, 652	.....	.....	.....
Average number sick daily	37. 40	.....	.....	.....
Average number sick daily per thousand.....	160. 51	.....	.....	.....
Average duration of treatment.....	58. 59	.....	.....	.....

for each disease and injury, at the several naval hospitals—Continued.

Pensacola, Fla.				Mare Island, Cal.				Yokohama, Japan.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.10				1.16	.....	.....	.....	.47	.....	.....	.....
6.66				6.70	.....	.....	.....	8.84	.....	.....	.....
13.33				38.54	.....	.....	.....	24.57	.....	.....	.....
15		2	.....	173	.....	40	2	53	9	6	1
1,000		133.33	.....	1,000	.....	231.21	11.55	1,000	169.81	113.20	18.86
558				8,380	.....	.....	.....	2,602	.....	.....	.....
1.52				22.95	.....	.....	.....	7.12	.....	.....	.....
101.33				132.65	.....	.....	.....	134.33	.....	.....	.....
37.20				48.43	.....	.....	.....	49.09	.....	.....	.....

SANITARY CONDITION
OF THE
NAVAL STATIONS.

NAVAL STATIONS.

The returns for the year 1882 from the various naval stations show a considerable increase in the movement of sick, as compared with the preceding year, as is exhibited in the following table which covers the period of four years:

	1879.	1880.	1881.	1882.
Total number of cases treated.....	2,639	2,399	2,590	2,871
Total number of sick days	22,351	17,661	19,012	20,483
Daily average number of sick.....	61.23	48.25	52.08	56.11
Average number of days under treatment.....	8.47	9.36	6.42	7.13

It is thus shown that the increase in the number of cases treated has been considerably greater than during any of the three preceding years, although the loss of time was less than in 1879. The daily average number of sick was greater than in the last two years. A comparison with the returns of last year show a decrease in the number of admissions in the zymotic and digestive classes of disease; the respiratory and genito-urinary classes about equaled the numbers of the former year, and there was a decided increase in the other classes.

	Presenting good cicatrices.		No evidence of previous vaccination.		Evidence of former attack of small-pox.		Total.
	Successful.	Unsuccessful.	Successful.	Unsuccessful.	Successful.	Unsuccessful.	
Navy-yard, Portsmouth, N. H.	12	13	22	5	0	0	52
Navy-yard, Boston, Mass.	75	96	20	0	1	2	194
Navy-yard, New York	24	45	3	2	0	0	74
Navy-yard, League Island.....	9	23	0	0	0	5	37
Navy-yard, Washington, D. C.	6	53	1	2	0	9	71
Navy-yard, Norfolk, Va.....	1	5	2	3	0	1	12
Navy-yard, Pensacola, Fla.....	38	5	134	1	0	0	178
Navy-yard, Mare Island, Cal.	4	102	0	0	1	13	120
Naval station, New London, Conn	0	2	0	0	0	0	2
Marine barracks, Brooklyn, N. Y.....	72	86	0	0	1	3	162
Marine barracks, Washington, D. C.....	42	47	10	13	1	3	116
Special duty, New York and Brooklyn	5	1	0	0	0	0	6
Naval Academy.....	203	294	111	71	8	10	697
Naval dispensary.....	27	68	3	1	0	0	99
Total.....	518	840	306	98	12	46	1,820
Per cent. of cases.....	74.6		22.2		3.2		.....
Per cent. of successful	37.4		75.7		20.6		45.9

NAVY-YARD, PORTSMOUTH, N. H.

The number of cases treated at this station during the year was 69, an increase of 6 over the number of last year. Of these, 41 recovered, 7 were transferred to hospital, 11 were invalided from the service, and 10 were continued. There were no deaths. The daily average number of sick was 7, the average duration of treatment 37.02 days, and the total loss of time was 2,555 days.

In the class of zymotic diseases there were 4 cases, 3 of intermittent fever, and 1 of erysipelas, with a consequent loss of service of 107 days.

The class of constitutional diseases gave 11 cases, 8 of rheumatism, 2 of adynamia, and 1 of lumbago. Two of the former were invalided from the service. The average number sick daily was 1.78, the average duration of treatment 59.09, and the total number of sick days 650.

The nervous affections were represented by 5 cases, 2 of dementia, and 1 of hysteria, melancholia, and paralysis, respectively. The subjects of all these cases were invalided. The total loss of time was 191 days, or an average of 38.2 for each case.

Diseases of the respiratory system contributed 17 cases, as against 10 last year. These included 7 of bronchitis, 6 of catarrh, 1 of emphysema, and 3 of phthisis pulmonalis. Two cases were invalided to hospital, and 2 from the service. The average number sick daily was 1.42, and the duration of treatment 30.52 days, the total number of sick days being 579.

Seven cases of diseases of the digestive system were reported, 1 less than in 1881; 3 were of hæmorrhoids, 2 of diarrhœa, and 1 of hernia and pharyngitis respectively. Two were invalided to hospital. The total number of sick days was 226, or 32.28 for each case, and the average number sick daily was .61.

The genito-urinary class gave 8 cases, the same number as last year, with a resulting loss of service of 143 days, and a daily sick rate of .39. Two cases of urethral stricture were invalided to hospital.

Diseases from violence were noted in 9 cases, a diminution of 4 from the number of last year. One case of fracture was invalided to hospital, and 1 of stremma and of gunshot wound from the service. The average duration of treatment was 48.11 days, the average number sick daily 1.18, and the total loss of service 483 days.

NAVY-YARD, BOSTON, MASS.

The number of admissions at this station during the year was 192, or 32 more than last year. Of these 42 were invalided to hospital and 2 from the service; 2 were continued. The daily average number of sick was 2.20, the average duration of treatment 4.19, and the total loss of service was 806 days.

The zymotic cases were 16 in number, a falling off of 4, as compared with last year, which included 7 of intermittent fever, 5 of vaccina, and 2 of erysipelas. The latter and 1 case of simple continued fever were invalided to hospital. The loss of service was 79 days, or 4.93 days for each case.

In the class of constitutional affections there were 31 entries, an increase of 6 over the number of last year. There were 12 cases of rheumatism, 9 of syphilis, 5 of adynamia, and 3 of lumbago. All the cases of syphilis, 2 of rheumatism, 2 of adynamia, and a single case of diabetes were invalided to hospital. The loss of service was 131 days, an average of 4.22 for each case.

The five cases occurring under the heading of nervous affections were 2 of neuralgia and single cases of dementia, epilepsy, and paralysis, most of which were invalided. The average period of treatment was 12.6 days, making the total number of sick days 63.

There were reported 33 cases coming within the class of respiratory diseases, a falling off from 53 last year, and a return to the numbers of 1880. These included 16 of catarrhus, 12 of bronchitis and 2 each of laryngitis and phthisis pulmonalis. One case of asthma was invalided from the service, and single cases of bronchitis, catarrhus, and phthisis were transferred to hospital. The loss of service was 176 days, the average duration of treatment having been 5.33 days.

Diseases of the digestive system contributed 38 cases, mostly of diarrhœa acuta and dyspepsia, and the loss of service amounted to 113 days. These figures show a movement of sick almost precisely the same as last year. But 1 case of dyspepsia was invalided and the average duration of treatment was 2.97 days.

The genito-urinary cases were 22 in number, corresponding almost to that of last year. They comprised 2 cases of orchitis and 17 of gonorrhœa, of which 13 were invalided to hospital, as was a case of urethral stricture. The loss of service was 63 days, or 2.86 for each case.

The cases of skin diseases numbered 70, of which 7 were of furunculus. Single cases of prurigo and tinea were invalided to hospital. The loss of service was 40 days.

There were 13 cases of alcoholic poisoning, giving a loss of 36 days or 2.76 for each case.

There were 21 admissions from diseases of violence, the same number as last year. The average duration of treatment was 4.28 days, and the total number of sick days was 90. Single cases of fracture and vulnus contusum were invalided.

NAVY YARD, BROOKLYN, N. Y.

Twenty cases were under treatment at this station during the year as against 30 last year. All returned to duty, excepting 3 invalided to hospital and 1 continued. The loss of service was 146 days, the duration of treatment averaging 4.76 days.

In the zymotic class, there were noted 4 cases, of which 3 were intermittent fever and 1 erysipelas; the latter was invalided. The loss of service was 10 days.

The cases of constitutional diseases were 2 of acute rheumatism and 1 of adynamia, which were under treatment for an average period of 20.66 days.

Diseases of the respiratory system yielded 2 cases of bronchitis acuta and a loss of service of 17 days.

Of the affections of the digestive system 6 cases were returned, 2 each of tonsillitis and acute diarrhœa, and single cases of dyspepsia and jaundice. The total number of sick days was 37, an average of 6.16 for each case.

The integumentary diseases were represented by single cases of abscessus and acne, the former being invalided to hospital. There were no cases of injuries recorded.

NAVY-YARD, PHILADELPHIA, PA.

There were recorded at this station 166 cases, an increase of 13 over the number of last year. Of these, 140 were discharged to duty, 25

were invalided to hospital, and 1 from the service. The number sick daily was 2.16, the duration of treatment 4.76 days, and the total loss of service 791 days.

This station returned a larger list of zymotic cases than any other excepting Norfolk, and the admissions for malarial fevers outnumbered even those at the latter point. There were in all 41 cases, of which 38 were of intermittent fever, 2 of remittent fever, and 1 of simple continued fever. Eight cases were invalided to hospital. The total number of sick days was 147, the average period of treatment having been 3.58 days. A progressive reduction, however, in the number of cases of malarial disease is shown, the number in 1880 having been 60 and in 1881 47, while for the present year it was 40.

Eighteen cases were numbered under the head of constitutional diseases, 11 of rheumatism, 1 of syphilis, and 6 of debility following intermittent fever. Three cases were transferred to hospital and 1 was invalided from the service. The number sick daily was .32, the average duration of treatment 6.5 days, and the total number of sick days was 117.

There were 9 cases of nervous diseases, the average duration of which was 9.88 days. One case of mania was invalided to hospital, and the aggregate number of sick days was 89.

The diseases of the respiratory system were about as frequent as last year, 13 cases having been reported, comprising 4 of bronchitis, 7 of catarrhus, and 1 each of laryngitis and pneumonia. One case of each disease was transferred to hospital. The number of sick days was 54, the average period of treatment having been 4.15 days.

Diseases of the digestive system were represented by 39 cases, 2 of which were diarrhœa, 6 of congestio hepatis, and 4 of colica. The figures under this head show a material increase over the number, 24, of last year. Four cases were invalided to hospital, and the total number of sick days was 182, or 4.66 for each case.

Eight cases of genito-urinary diseases were returned, less than one-half the number of last year, 17. They included 3 cases each of gonorrhœa and orchitis, and single cases of enuresis and urethral stricture, which were invalided. The loss of service was 95 days, and the average period of treatment was 11.7 days.

The number of injuries reported was 16, as against 12 last year. Single cases of congelatio and contusio were transferred to hospital. The average period of treatment was 5.06 days, and the aggregate loss of service was 81 days.

NAVY-YARD, WASHINGTON, D. C.

A marked falling off in the sick movement of this station is shown, as compared with that of last year. The number of admissions was 110, while in the preceding year it was 153. The number discharged to duty was 95, 13 were transferred to hospital, and 1 died. The daily average number of sick was 1.69, the average duration of treatment 5.60 days, and the total number of sick days was 617.

The cases of zymotic disease reported were 5 of simple continued fever, 30 of intermittent, and 2 of remittent fever, making a total of 37, as against 50 last year. Five cases were transferred to hospital; the average duration of treatment of the remainder was 5.08 days, making the aggregate number of sick days 188.

Two cases of adynamia, 5 of rheumatism, and 1 of syphilis were

grouped in the class of constitutional disorders, 8 in all, as against 11 last year, and giving a loss of time of 40 days.

The diseases of the nervous system were noted in 9 cases, 1 of which, a case of mania, was invalided. The average period of treatment was 9.88 days, and the total number of sick days was 89.

The diseases of the respiratory organs were represented by 13 cases, as against 12 last year, and included 5 of bronchitis, 2 of catarrhus, 2 of laryngitis, and single cases of phthisis, pleuritis, and pneumonia, the latter being transferred to hospital, with 1 of bronchitis acuta. The average duration of treatment was 4.69 days, and the total loss of service 61 days.

Thirteen cases were returned under the head of diseases of the digestive system, a considerable increase over the number of last year, which was 8. The principal factors were pharyngitis 5 and diarrhœa 4. There was no invaliding, and the aggregate number of sick days was 63.

Diseases of the genito-urinary system contributed 6 cases, a marked falling off from last year, when there were 17. They included 3 of gonorrhœa, 2 of orchitis, and 1 of urethral stricture. The loss of service was 27 days, and there was no invaliding.

There were only 3 cases of skin diseases, as against 6 last year, and the 4 cases of alcoholismus is an increase of 3 over 1881.

Eleven cases of injuries were recorded, none of a serious character, the average duration of treatment having been 3.36 days.

NAVY-YARD, NORFOLK, VA.

An aggregate of 153 cases were returned from this station, a diminution from 197 last year. Of this number 114 were returned to duty, 38 were transferred to hospital, and 1 was continued. The daily average number of sick was 1.63, and the average duration of treatment 3.88 days, so that the total loss of service was 595 days, which is more than double that of last year.

There were reported 43 cases of zymotic diseases, which is about the same number as last year, and they were, with the exception of 1 case of erysipelas, made up entirely of malarial fevers. Eleven cases were transferred to hospital, and the remainder were under treatment for an average period of 2.88 days. The loss of service was 124 days.

The constitutional class contained the records of 10 cases of acute rheumatism, 7 of syphilis, and 1 of lumbago, 18 in all, the same number as last year. Seventy-seven days were lost in time, and 4 men were invalided to hospital.

Eight cases of nervous diseases were recorded at this station, as against 10 last year, of which 1 case of cephalalgia was transferred to hospital, which afterward developed into abscess of the brain, and ended fatally. The loss of service from this class was 45 days.

There were 9 cases of diseases of the respiratory system reported, mostly of a catarrhal character; and there was 1 case of pleuritis, which was invalided to hospital. The average duration of treatment was 5.66 days.

The diseases of the digestive system afforded 41 cases, which were chiefly made up of diarrhœa (29) and cholera morbus (8). Seven cases in all were transferred to hospital, and the average period of treatment was 3.31 days, making an aggregate of sick days of 136. The sick rate of this class was nearly the same as last year.

The genito-urinary cases were 12 in number, of which one-half were

of gonorrhœa. Eight cases were invalided to hospital, and the number of sick days contributed by the remainder was 36.

There were 6 cases of skin disease, mostly of eczema and furunculus, and but 1 case of alcoholic poisoning was noted.

The injuries recorded were 11 in number, as against 18 last year. Two cases of luxatio and 1 of contusio were invalided to hospital. The average duration of treatment was 4.72 days, and the total loss of time 52 days.

NAVY-YARD, PENSACOLA, FLA.

At this station the number of cases treated during the year was 44' nearly double that of last year. Six cases were invalided to hospital, and 2 were continued. The loss of time amounted to 238 days, or 5.40 days for each case.

Eight cases of malarial fevers comprised all of the zymotic cases, which required an average of 6.12 days' treatment.

Two cases of adynamia and 1 of lumbago were comprised in the constitutional class, and the latter was invalided. The loss of service was 9 days.

The class of respiratory affections embraced 4 cases of bronchitis and 1 of catarrhus, and the average duration of treatment was 4.8 days.

The digestive class contained the records of 7 cases, chiefly of diarrhœa, and 1 case of hæmorrhoids was invalided. The loss of service was 28 days, or 4 days for each case.

Most of the cases of admissions at this yard were for injuries, of which there were 11 cases. One case of contusion was invalided to hospital, and 82 days of time were lost. The average period of the treatment for these cases was 7.45 days.

Surgeon A. M. Owen has made an elaborate report regarding the yard and its surroundings, and relates some interesting facts relative to the epidemic of yellow fever in Pensacola, as well as to the means which were adopted to prevent its incursion into the navy-yard. The report is as follows :

As a whole, the yard is kept clean and neat, although the beach-front upon the east is often littered up by *débris* drifting upon it from various quarters of the bay. The refuse which thus collects along the shore, coming, as it does, partly from the ships in the harbor and partly from the neighboring city, is often, through insufficient police supervision or other causes, allowed to be exposed for a long time to the action of the elements. Being soaked daily with sea water, at the flood tide, and then at the ebb subjected to the influence of the tropical sun, such substances rapidly decompose, and undoubtedly furnish a most congenial soil for the development of the minute germs, which some authorities accept as the sources of yellow fever. There are cases, at all events, where a certain moisture of the soil and an accumulation of animal and vegetable substances passing into putrefaction would seem to have an influence in the causation of the disease. It is suggested that a rigid policing of the beach in question should be made daily during the summer and fall, and when yellow fever prevails at quarantine, in the city, or on board the shipping in the bay of Pensacola; and that all trash, rubbish, and refuse thus found should be destroyed immediately by fire or buried *in situ*. Materials which freely absorb fluids and gases should, in our ignorance of the yellow-fever fomites, be treated as dangerous, as such have repeatedly given rise to justifiable suspicions of being among the agents for transmitting the poison. Not only have mattresses and bedding, thrown overboard from infected ships at the quarantine station, been picked up on the said shore during the recent epidemic, but dead bodies have been lately found upon it. This point deserves consideration, and has thus been dwelt upon somewhat at length.

Just prior to the close of 1881 a guard of marines, numbering 30, rank and file, with a captain and first lieutenant, was added to the station. They occupy three wooden and one small brick one-story buildings, situated at the south side of the yard, facing the bay. These quarters are comfortable, convenient, and thoroughly ventilated. They are sufficiently heated during the mild, short winters by stoves, and serve well the purpose for which they are used, being ample for the present strength of the

guard. The kitchens, mess-room, and privies are well located and carefully kept, the drainage and excreta receiving the proper care and attention. The guard-house and cells are suitable for their purposes, being well built and kept, both as regards neatness and repairs. Appropriate sheds have been erected at the gates as shelters for the officers and sentinels of the guard when on duty. They are particularly useful during the long summers to protect the men from the sun's rays.

It is to be noted that the marines are for the greater part recruits of a year's service. With a few exceptions, they were enlisted in the East and North, and are unacclimated, and not even inured to a soldier's life. They are a good company of men, and appear to be contented with their duties and station; but it is suggested that in accordance with the idea thrown out by the report of the naval board which examined into the facts relative to the epidemic of yellow fever at this station in 1874, it might be advisable to do away with the marines at the Pensacola yard. This subject will be referred to again in this report.

Attention is now invited to the towns of Warrington and Woolsey, situated on the naval reservation, immediately adjoining the yard—to the west and north, respectively. The former has a population of some 1,200, the latter claims about 700 persons. These inhabitants are the workingmen employed at the station by the Government, and their families, as well as many others reside on the reservation with the permission of the commanding officer. Among the number are pilots and fishermen with their families; also the various merchants and storekeepers who help to make up the population of small villages, and are essential to administer to the welfare and comfort of the populace. It is to be said that the citizens of the reserve are a law-abiding, orderly people under all circumstances.

During half of the year quarantine restrictions, which must necessarily be enforced by the station, interfere with those whose calling make it requisite for them to leave the reservation, and thus, unfortunately, is brought about slight conflict of authority and interests, and, in some instances, great hardships. These facts have been well illustrated during the recent epidemic of yellow fever which prevailed in this vicinity.

The houses of these towns are constructed exclusively of wood, and are, as a rule, old, rotten, and dilapidated, so that in the event of an infectious or contagious disease getting into them it would be next to an impossibility to disinfect and cleanse their various nooks and crannies by any means now known. Indeed, it was recommended to the commanding officer here by the surgeon that should yellow fever make its appearance in them they ought to be destroyed at once by fire. This would be, undoubtedly, a heroic method of dealing with property and disease, but it is judged that such a course would be admissible, suitable, and proper, as well as economical in the end, under the circumstances. The side walks, where such exist, are made of wood, and are, with few exceptions, rotten and exceedingly defective. These terms apply also to the fences and out-buildings in great measure.

There is an attempt at surface drainage, but it may be said to be worse than none at all. The open sewers, or rather ditches, which now exist in the principal streets, should be filled up, and clay or terra cotta pipes laid in a manner to carry off the surplus waters. It is quite patent to any observer that these ditches, as existing now, are mere repositories for the refuse, filth, and garbage of the neighboring residences, which constantly chokes them throughout their course. They certainly serve no good purpose. The civil engineer of the station could and would put this all-important matter into proper shape were the Department to give him the authority to do so. No cess-pools are allowed on the reserve, the excrementitious matters being carried off and buried frequently, the captains of the watch of the station making a weekly inspection of each of the premises, and a report of the facts as to this subject. But the streets and compounds are badly policed, and this state of affairs deserves the attention of the commanding officer, who has full authority in such matters.

The senior medical officer of the station is required to make a written report of the sanitary condition of the reservation semi-monthly during May, June, July, August, September, and October, with such recommendations as may seem to him necessary for the health and comfort of the inhabitants. Unfortunately, during the months just named of 1882 there were no funds with which to carry out the measures advised by this official, and the residents of the reserve should be required to take such steps as may be judged requisite to the proper cleansing of the thoroughfares, premises, and ditches.

The streets of neither town are lighted. Kerosene oil is the means of illumination of the houses. As a rule, it is of indifferent quality, and is burned in the cheapest sort of lamps, many of them being without chimneys or guards of any kind, and it is remarkable that accidents resulting therefrom are not of frequent occurrence. On the 6th October a general conflagration destroyed most of the business portions of Warrington, some forty houses and stores being consumed, including the Catholic church, convent, school-house, and parsonage; also the one drug store and hotel of the reservation. It is fair to infer that this disaster was caused by this mode of lighting.

The water supply of these towns is indifferent and precarious; indeed, for a fact, much of it is exceedingly bad. For the most part it is collected in barrels and hogs-

heads from the roofs of the dwellings. These roofs of shingles and boards are much decayed, worm-eaten, and moss-covered, and, therefore, as might be expected, the water from them is contaminated with animal and vegetable matters. During the latter part of the summer it becomes noisome in numerous instances. There are a number of wells on the reserve without the navy-yard, but, so far as ascertained, few, if any, of them contain potable water. And yet, during the past year, diarrhœas, dysenterys, and bowel-complaints were almost unknown.

The timber ponds belonging to the Government, situated about a quarter of a mile to the north of the yard, have been thoroughly cleaned by dredging and raking and put in good order during the year, so that they present rather an attractive feature in the landscape.

There has been no noticeable destruction of the trees on the reserve during 1882, and it is highly desirable that the remaining groves, consisting in the main of pines, live, water, and scrub oaks, be carefully preserved, as they play an important part in the sanitation of the station. The great enemy of this region is not, as is generally supposed by the outside world, yellow fever, but is congestive remittent fever, or, as termed here, "bilious fever." Now, etiologists have long considered the vicinity of pine forests as mitigating the effects of the so-called malarial poisons. At all events, the disease last named is said to be rarely contracted by those residing among these trees. Aside from the sanitary advantages gained by preserving the fine groves on the reserve, they are pleasing to the eye, and are no little protection from the sun's rays during the long summers.

The climate may be termed salubrious and pleasant all the year round. Sudden and great changes are infrequent if not unknown. The temperature has ranged during 1882 from 94° Fahrenheit's scale, July 17, to 26° F. December 8. The coldest month of the year was February, having a mean of 59.07° F., and the hottest, June, according to the thermometer, which recorded 80.56° F. But the most oppressive weather was during the latter part of August and in September, which was owing, in great measure, to the fact that the land and sea breezes failed, with a temperature of about 78° F. day and night. In June, July, and the early portion of August, the strong winds from the southeast so modified the heat that the high temperature was not excessively disagreeable or trying. In the early fall mosquitoes became troublesome throughout the twenty-four hours. It is noteworthy, however, that even in mid-summer sun-stroke is not known here.

The summer of 1882 is said to have been an exceptionably pleasant one, there being no "hot waves" as experienced in New York, Philadelphia, and Washington.

A synopsis of the meteorological report for 1882 is here added:

Months.	Mean height of barometer.	Mean tem- perature.	Rainfall.	Direction of wind.
	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	
January	30.366	62.69	2.36	SE.
February	30.356	59.07	3.70	NNE., ENE.
March	30.356	66.80	2.79	SE., SW.
April	30.122	72.08	4.60	E., S. SE.
May	30.218	73.58	2.35	SE., SW.
June	30.245	80.56	4.58	W., E. by S., SW.
July	30.272	78.97	4.51	SW.; E. by N., E. by S.
August	30.214	80	12.02	E. by N., E. by S., SW.
September	30.179	77.93	9.18	NE., SE.
October	30.142	73.61	5.27	NE., N.
November	30.236	61.35	3.69	NE., NNE.
December	30.250	53.58	5.69	NNW.

The average for the year being, for the barometer, 30.246; the thermometer, 70°.02 F.; and the total rainfall 60.74 inches.

The health of the residents of the yard and reserve, for the year was markedly good. There was a number of cases of malarial fevers, some half dozen being of a severe character, remittent in type. They all yielded readily to treatment.

Yellow fever prevailed as an epidemic in Pensacola and vicinity during the autumn. Some 2,400 cases of the disease, with nearly 200 deaths, were reported from the date (August 28) that the scourge was officially made known as in the said city, until the plague was declared over, November 21 = 86 days.

It is certainly the fact that yellow fever existed in Pensacola for at least fourteen days before the board of health acknowledged it; there being, as now stated, between 15 and 20 cases, with a number of deaths, prior to the public announcement.

So certain was this office of the presence of the disease in the city, on August 12, that an official communication was addressed to the National Board of Health, in which

facts and authenticated reports were set forth, and the opinion expressed that the said fever existed among the people; and that, should official information be awaited, the time for prompt action in the matter might have passed, as regards the institution of measures for the protection of this station.

On April 10, 1882, the location of the quarantine station for Pensacola and the bay was moved from Deer Point, on the mainland, some 4 miles from the city, to Little Sabine Inlet, on Santa Rosa Island, three-fourths of a mile to the east and south—a situation about 4 miles from the navy-yard, north of east. Immediate steps were taken to erect suitable buildings as a hospital, officers' quarters, supply depot, &c. These structures were not completed and turned over to the quarantine physician until late in June.

May 15, according to the ordinances of Pensacola, quarantine went into effect, but in reality it was not until the latter part of June that any serious attempts were made to carry out the rules and regulations demanded alike by law and prudence. The inspecting authorities, it is true, made visits to incoming vessels, took the legal fees, and there began and ended, for the most part, the observations of the shipping, during the early summer. At the date of the commencement of quarantine, May 15, as given, two warrant officers of the Navy and six men were sent by the commanding officer of the station to the monitor *Canonicus*, which was moored between Deer Point and Little Sabine Inlet as a guard-ship, to aid and assist in carrying out a rigid quarantine and to note events. Boatswain Crissey, the officer in charge of this duty, soon reported officially that the regulations were not being observed, and that the quarantine was a farce. Sailor runners and boarding-house keepers, ship-chandlers and stevedores, were allowed to come and go at all times pretty much as they pleased, having the written permission of the board of health. Free intercourse was allowed between the quarantine physician and his family and others; indeed, this official resided with his wife and children on the mainland until some time in July. The officers and men of the ships kept up their visiting mutually, regardless of the state of their vessels, or the conditions of their crews.

On the 15th of June the *Canonicus* was withdrawn from duty as guard-ship, by order of the honorable Secretary of the Navy, and sent to Norfolk, Va. No vessel was substituted, but a warrant officer was retained at the station to observe how affairs were conducted. Owing to this officer's inexperience in such matters, and illness, he was soon recalled and thus all aid from the naval station ended for the season, so far as assisting in the quarantine for Pensacola was concerned.

About this period, June 15, the bark *Zebra* came to the lazaretto from Havana, Cuba, with yellow fever on board; and two days subsequently she was dispatched to Ship Island, Mississippi. From this date until August 10 a number of vessels arrived at the said station having the disease among the crews, or had it developed while detained there for observation, and they were sent to Ship Island after more or less delay.

During June and July the surgeon of the naval station repeatedly expressed to the commanding officer the belief that the quarantine as conducted at Little Sabine Inlet was loose, and of little or no protection against the introduction of yellow fever by infected vessels into the city of Pensacola. The commanding officer, on a number of occasions, put like views into writing, addressed both to the board of health of Pensacola and to the quarantine physician, calling attention to the several adverse reports he had received relative to the subject, but no good came of any of the suggestions or complaints made from or to either party; finally the correspondence became unpleasant and was discontinued.

On the 8th August the mate of a Spanish bark *Salitto*, lying at one of the wharves in Pensacola, was taken ill, and the attending physicians judged the disease to be yellow fever, although they made contradictory statements relative to its nature at the time. The following day the cabin boy and a sailor were seized with the fever, and on the 10th the mate perished from the disease, black-vomit making its appearance just prior to death. That same afternoon the ship was towed to sea, taking her dead and sick men with her. The board of health of Pensacola did not make known to the public the character of the malady. There was much excitement in the city, and many persons made ready to decamp, a number actually departing. It appeared subsequently that the two invalids in the bark died a few days after getting on the high seas, and it is known that the three men who perished were the only members of her crew unprotected from yellow fever by a former attack of the disease. As this ship was in all probability the craft by which yellow fever was introduced into Pensacola, a few words as to her recent history will be appropriate. She sailed from London, England, with a general cargo for Havana, Cuba. At the last-named port she discharged a portion of her freight; and then went to Matanzas, Cuba, where the remainder of her load was landed, and ballast, consisting of rubbish and *earth* from said city, was put on board. She then sailed for Pensacola, and after a voyage of nine days arrived at the quarantine station here, where she remained twenty days, and five days before coming to the city proper the most of her ballast was thrown into

the crib, the vessel fumigated and disinfected. On the thirty-fourth day after her arrival in the port, the fever made its appearance, as stated, on board. Relative to the condition of the Salitto while off the city, the physicians and others were and are in dispute. Whether or not this bark was infected in Cuba or got the disease at the Pensacola crib is not known at this office. Other reports will most likely give this information, but, as stated, it is undoubtedly the fact this vessel brought the infection to Pensacola.

August 12 the captain of the Vincenzo Accame, at anchor off the city, died from what was generally termed "suspicious fever" in a boarding-house to which he had been taken from his vessel. A few days afterwards two sailors and a clerk who had been much in company with the said captain also perished from fever. The captain of the Accame, the mate of the Salitto, and the clerk in question were boon companions, not only on board the Salitto, but in the saloons and houses frequented by sailors and their runners. From this date, to August 22, there was a number of cases of yellow fever admitted to be on board the shipping in the harbor, and deaths from fever, stated to be bilious remittent by the attending physicians, were of frequent occurrence on shore. Thus the suspicions of the citizens were increased. Many persons departed, being, if not convinced of the existence of the disease in their midst, at least alarmed at the various startling rumors relative to its presence.

On August 11 the commanding officer of this station was advised by the senior medical officer to restrict the officers and residents of the reserve in their communications with Pensacola until the true state of affairs was known. This recommendation was acted upon; and to this early partial quarantine against the city may be attributed in great measure the immunity enjoyed by this section from the scourge which followed. In a few days these restrictions were more marked, and by the 20th August intercourse between the station and Pensacola was practically suspended.

On August 25 the commanding officer was recommended by the surgeon of the yard to send the marine guard away in the event of yellow fever getting a footing in the vicinity, and on the 29th of the same month this advice was repeated. In the histories of the several epidemics at this yard it appears, from official and other reports, that the marines were the first to contract the disease, if, in fact, they did not bring it to the station from neighboring places.

Disputes between the citizens and the board of health, and between the several members of the board, relative to the nature of the fevers then prevailing in the city were of frequent occurrence, until at last, on August 28th, yellow fever was officially announced, 9 cases being acknowledged at that date as existing on shore.

As soon as this intelligence was received at the station a picket-line, composed of the acclimated workmen of the yard, was placed around the reservation. The cordon thus formed was about $4\frac{1}{2}$ miles in length, some seventy-five men being enrolled for this duty. "A" tents were pitched on the line, a swath about 30 feet wide being cut through the woods and thickets, to give an unobstructed view as well as a clear beat. The principal roads were well guarded, the lesser ones being blockaded by abatis, made of brush, and thus made impassable. All the boats on the Bayou Grande were seized and put out of service. A part of the regular watchmen of the yard were encamped at the bayou bridge, on the road to Pensacola, and it was here that the incoming mails were thoroughly fumigated and the outgoing bags delivered. The steam-launch patrolled the beach at night during the early part of the epidemic, and was kept under steam during the day, to observe and warn off all approaching ships and boats.

It was recommended that the marines be not sent on picket duty, as was first intended, but that they be directed to accompany the United States troops of Fort Barrancas to Mount Vernon Barracks, Alabama. This recommendation was acted on by the commanding officer of the station and confirmed by the telegraphic order of the Acting Secretary of the Navy. The following day the soldiers, marines, certain officers of the yard, and the families of officers took their departure for Alabama on board a steamer which came from Mobile, Ala., for the purpose of moving the troops from Barrancas, by permission of the board of health of that city, upon the receipt of a telegraphic certificate from the surgeon of the naval station that there was no yellow fever on the reservation, and that a rigid quarantine had been established against Pensacola and vicinity. Permission for the officers and families, residents of the navy-yard, to go in the steamer was at first refused, but upon proper representation that no one of them had been in Pensacola within two weeks they were allowed to start.

It is a well-known principle that the best way to diminish the chances of an epidemic of yellow fever is to get rid of as many of those susceptible to it as is possible, and hence the desire to have all unacclimated persons leave the place. In a few days all the neighboring cities and surrounding country were quarantined against Pensacola and its vicinity.

On the 30th of August the surgeon of the station, at the request of the commanding officer, asked the board of health of Mobile to allow the steamer Morgan to bring

provisions to the reserve, which was granted, the same certificate being required as on the 29th. On September 1 the ship came and departed, a number of persons taking this opportunity to quit the place, having the required bills of health. September 8 other officers and families left the yard on board a pilot schooner, which was chartered to carry them to a point at the entrance to Mobile Bay, the health authorities of that city having granted them permission to land upon certain conditions, certified to by medical officer of the yard. On this day the disease was declared epidemic in Pensacola. A few days after the citizens of the reserve, by request, volunteered to come to the assistance of the naval authorities to aid in maintaining the armed picket line; all the males above the age of sixteen years being enrolled for such service, to the number of about 400.

As regards the cordon it may be well to state that all the posts were regularly numbered from 1 to 41, and each day those whose tour of duty had come were notified of the fact. Two individuals were told off for each post, and they arranged to suit their own convenience as to how they would stand their twenty-four hours' guard. No male was excused from picket upon any pretext, unless he had a certificate of physical disability from the surgeon of the station. He had to stand guard when his turn came or get a substitute, and no officer was excepted from this rule. The orderly sergeant, the one marine, who was left in charge of the barracks, with the captains of the watch, visited and inspected each sentinel at regular times day and night. Other officers made it a duty to go the rounds frequently.

During the latter part of September the disease began to spread to the country about Pensacola, and this fact made great vigilance necessary along the lines, as a part of the citizens of the reserve, who had taken refuge in the vicinity, now desired to rejoin their families and homes.

About the middle of October the scourge had reached Perdido Bay, to the west of the reserve, thus making a semicircle by land of the naval station. There was, upon several occasions, some alarm among the inhabitants of the reservation, it being rumored that the malady had appeared among the pickets and others, but, happily, such was not the fact, bilious remittent fever being the type of disease which had given rise to such reports and uneasiness. Not a single case of yellow fever appeared within the cordon, all reports to the contrary notwithstanding.

The medical officer of the station was ordered to familiarize himself with every case of sickness among the 1,700 residents, and to make report of any suspicious symptoms which might appear. Moreover, this official had to board, inspect, and give, or refuse, pratique to every vessel and boat, large and small, wishing to land at the station, as well as to advise the boards of health of the neighboring cities of the status of affairs at the naval reserve, and to give bills of health to all persons wishing to leave the station. The only avenue of communication with the country at large was via Mobile, and the health authorities of that city would not allow any person to land from this reservation without a certificate signed by the surgeon of the station.

It has been judged proper to give a part of the details of the quarantine as established and maintained by the naval station during the recent epidemic of yellow fever in the neighboring city and country, as well as a running account of the most prominent events connected therewith. But two commissioned officers remained at the station during the state of siege—the lieutenant commanding and the medical officer, and there were also two warrant officers. The latter are acclimated, being residents of the place. A third warrant officer, also a resident, went away on sick-leave, at the date the fever was declared epidemic in Pensacola, and did not return until October. There were five men—the crew of the United States tug *Rose*—on duty in the steam-launch a portion of the time, and standing post the remainder—thus making, all told, ten persons belonging to the service proper on duty at the station.

In conclusion, it may not be out of order to give an opinion relative to the quarantine as it existed at Little Sabine Inlet during the past season. It was badly managed, inefficient, and practically worthless. Dr. R. B. S. Hargis, president of the board of health of Pensacola, in an official letter to the writer of this report, dated the 16th September, 1882, states that "the introduction of the monster into our city is undoubtedly attributable to *imperfect disinfection at quarantine*" (the underscoring being the doctor's).

It may be stated, in round terms, that no quarantine which is likely to be established by the State of Florida or the city of Pensacola in the immediate future will give the proper protection to the citizens of this section against the introduction of yellow fever. To give immunity, the national Government must probably take charge of this important matter.

NAVY-YARD, MARE ISLAND, CAL.

The reports of this station contained the reports of 106 cases, an increase of 29 over the number returned last year. The number of recov-

eries was 89; 12 were transferred to hospital, 3 were invalided from the service, and 2 were continued. The average number sick daily was 3.90, and the average duration of treatment was 13.46 days, and the total number of sick days was 1,427.

Only 5 cases of zymotic diseases were noted, the average duration of which was 5 days. The cases were 1 each of erysipelas, continued fever, and febricula, and 2 of intermittent fever.

Nine cases of constitutional affections were noted, 5 of rheumatism, and 4 of syphilis. The loss of service averaged 11.44 days for each case.

The nervous affections were represented by 7 cases—3 of epilepsy, 1 of melancholia, and 3 of neuralgia. One case of each disease was invalided to hospital. The average period of treatment was 22 days, and the total loss of time amounted to 154 days.

The respiratory class of diseases yielded 17 cases, as against 10 last year, and the larger number were catarrhal. One case of laryngitis was invalided, and there were single cases of pleuritis and pneumonia, which recovered. The total loss of service was 175 days, an average of 10.29 per case.

Diseases of the digestive system comprised 15 cases, 8 less than the number last year; of which 1 case of dyspepsia was invalided from the service, and single cases of acute hepatitis and pharyngitis were transferred to hospital. The average duration of treatment was 9.66 days, and the total loss of service 145 days.

Eleven cases fell within the group of diseases of the genito-urinary system as against 5 last year, and they included 4 each of gonorrhœa and orchitis, and 1 each of colica nephritica, nephritis, and spermatorrhœa. Two cases were invalided, and the time lost was equal to 224 days; the average duration of treatment was 20.36 days.

There were 19 cases of injuries, as against 17 last year, with a loss of 167 days, or 8.78 for each case.

MARINE BARRACKS, BROOKLYN, N. Y.

The number of cases returned from this station for the year 1882 was 440, 8 less than the number of last year. Of these, 370 were restored to duty, 60 were invalided to hospital, and 10 remained. The average number sick daily was 7.80, and the average duration of treatment was 6.47, so that the entire loss of service amounted to 2,850 days. As compared with the preceding year, the movement of sick very nearly the same, being very slightly increased.

The zymotic cases numbered 55, as against 65 in 1881, of which all were intermittent fever, except 1 case of morbilli and 3 of vaccina. Three of the former, and the single case of measles, were invalided. The average period of treatment was 4.74 days, and the total number of sick days was 261.

The constitutional cases were 80 in number, an increase of 1 over that of last year. They were 37 of rheumatism, 38 of syphilis, and 4 of lumbago. Nineteen were transferred to hospital, and the loss of service amounted to 660 days.

Twenty-five cases of nervous diseases were returned, of which the greatest number, 13, were of neuralgia; 6 were of paralysis and 2 of epilepsy, the latter being invalided. The average loss of service was 4.04 days, and the total loss 154 days.

Diseases of the respiratory system were reported in 45 cases, as against 51 last year. Of these 36 were catarrhus, 3 bronchitis, and there were simple cases of hæmoptysis, phthisis, and pleuritis, which were inva-

lided. The number of sick days was 210, and the average duration of treatment 4.88 days.

The diseases of the digestive system were represented by 89 cases, as against 135 last year. The chief factors were, diarrhœa 39, cholera morbus and tonsillitis, of each 12, dyspepsia 6, and constipatio 5. Nine cases in all were invalided, and the number of sick days was 332, while the average duration of treatment was 3.73 days.

The genito-urinary affections contributed 55 cases, a large increase over the number of last year, 29. Of these 36 were of gonorrhœa, 9 orchitis, and 4 cholera nephritica. Twelve cases were invalided to hospital, and the loss of time was 564 days. The average number of sick daily was 1.54, and the average duration of treatment was 10.25 days.

Diseases of the integumentary system included 24 cases, as against 8 last year. The average duration of treatment was 9 days, and the total loss of time 216 days. One case of eczema was invalided to hospital.

Nine cases of alcoholismus were reported, of which 2 were invalided to hospital. The loss of time was 2.33 days.

Injuries were reported in 46 cases, as against 31 last year, of which 2 cases of fracture were invalided. The loss of service was 335 days, and the average period of treatment 7.28 days.

Surgeon E. Kershner, in his sanitary report, remarks :

The station has been very healthy during the year, and no epidemic has appeared. There have been many cases of malarial disease, but I find upon investigation that they are not wholly due to malaria emanating from this vicinity. Very many are cases of disease originally contracted elsewhere in various intensely malarial districts.

As the Marine Corps is mainly recruited from a roving class of men, large numbers of them have been exposed and contracted disease in those districts. In such persons the exposure to night air on the edge of the Wallabout Swamp, where many sentries are stationed, has been sufficient to develop the disease. By careful questioning in regard to the former health of such candidates for enlistment many might be detected and prevented from enlisting. Very many of the men have suffered from venereal diseases, but there does not appear to be any way to prevent this state of affairs, excepting a constant quarantine, which is, of course, impracticable.

Many men are enlisted who are weak, feeble, and improper men for the Marine Corps, and some develop imperfections after a short stay in the barracks which existed, although impossible to detect, at the time of examination. It is my opinion that such worthless men should be at once discharged the service on recommendation of the surgeon without sending them through the circuitous, uncertain, and expensive routine of a naval hospital, where they may be discharged, but frequently are not.

The soil upon which the barracks are located is ground made by filling up the swamp, and consequently very low and wet, giving a very poor chance for drainage. This is undoubtedly a cause of disease; the health of the men on post and in barracks is also affected more or less by emanations from the mouth of the Brooklyn sewer, especially when the wind is from the west. This however will soon be remedied by the construction of an extension of the sewer through the navy-yard, which will throw the sewage into the river instead of the back channel of the Wallabout.

The barracks building appears to be a good one, and in good sanitary condition. The men, when the barracks are full, have an average of about 730 cubic feet of air space, which, of course, would be little enough if the barracks were always full. But for the small force usually quartered here the room is ample, a good many of the beds being unoccupied. I respectfully recommend the heating of the barracks by steam instead of stoves, as at present. The stoves give out a variable degree of heat, and indeed the fires sometimes go out altogether, a source of colds, and chest, and throat troubles. The cooking could then be done by steam also, which would be a great improvement on the present system. I also suggest that steam heat be used in the guard-room, and officer-of-the-day's room, as the variable degree of heat in the guard-room has been a source of much disease. The lower floor of all the buildings have been damp most of the time, and this is probably due to insufficient supply of air between the lower floor and the earth. In the house of the commanding officer the only ventilation of this space is through a few gratings about a foot square, which is almost useless. These openings should be enlarged so as to extend fifteen or twenty feet along two sides of the house, so as to create a free flow of air through from one side to the other. The main building is defective in the same respect, and I recommend that

it be remedied in the same way. The sewer leading from the commanding officer's house should be tapped outside the wall of the house so as to permit the escape of sewer gas to the open air. This is especially necessary as there is no sewer gas-pipe leading to the roof from the inside of the house, and one would not be required if the sewer is tapped on the outside.

The water closets in the post hospital empty into a cess-pool which has to be frequently emptied and cleansed at considerable cost. A drain-pipe laid from the cess-pool or water closet to the sewer at the east end of the building, a distance of about forty feet, would carry off all this material into the sewer and thus remove a nuisance and save the expense of frequently cleaning the cess-pool. A bath tub for patients and a water-closet for the medical officer should be placed in the sick bay.

The building is well lighted by gas at night, and a sufficient number of windows by day, leaving nothing to be desired in this respect. The rations are abundant and of first quality. I have heard of no complaint of them whatever.

The water is supplied from the city of Brooklyn water-works, and is said to be very pure. The clothing of the men appears to be of good quality, and I have heard of no complaint of it. The men are furnished Arctic over-shoes, which I consider a most valuable article and a great safeguard to health. I have repeatedly recommended that these over-shoes be furnished to the sailors, but they have not as yet been adopted in the Navy. A long rubber rain-coat would be of the greatest use to the men, and I urgently suggest the adoption of such an article as part of the outfit for marines.

MARINE BARRACKS, WASHINGTON, D. C.

There were treated at this station during the year 112 cases, an increase of 10 over the number of last year. Of this number 96 recovered, 15 were invalided to hospital, and 1 was continued. The daily average number of sick was 2.41, the average duration of treatment was 7.86, and the total loss of service amounted to 881 days.

The cases of zymotic diseases reported were 16 in number, and of these 12 were intermittent fever and 2 vaccina. The average duration of treatment was 2.58 days, and the total number of sick days 108.

The constitutional affections comprised 8 cases, as against 18 last year, and they were made up of 5 cases of rheumatism and 2 of syphilis. Two of the latter were invalided to hospital, and the loss of service was 107 days, or 13.37 for each case.

Twelve cases of diseases of the nervous system were noted, of which the major part were neuralgia. Single cases of apoplexia, dementia, and epilepsia were invalided, and the aggregate loss of service was 87 days. The average duration of treatment was 5.55 days.

Diseases of the respiratory system afforded 15 cases, an increase of 6 over last year. They were chiefly catarrhal and bronchial, and there were 3 cases of pneumonia and 1 of phthisis, which were invalided to hospital. The number of sick days was 89, and the average duration of treatment 5.93 days.

There were 22 cases grouped among affections of the digestive system, an increase of 3 over the number of last year. One case of icterus was invalided to hospital, and the loss of service was 114 days, an average of 5.17 for each case.

The class of genito-urinary diseases contained a record of 3 cases of gonorrhœa, and single cases of ischuria and nephritis. The average duration of treatment for these cases was 8.8 days, and the total loss of service was 44 days.

Of diseases of the integumentary system there were reported 1 case of abscessus, 5 of furunculus, and 1 of urticaria, and the loss of service amounted to 31 days.

Sixteen cases of injuries were returned, double the number last year. But 1 case was invalided, which was a contusion. The loss of time was 70 days, or 4.37 for each case.

NAVAL ACADEMY, ANNAPOLIS, MD.

The number of cases given in the reports from this establishment for the year was 1,222, an increase of 142 over the preceding year. Recovery took place in 1,204 cases; 7 were invalided to hospital; 3 were discharged from the service, and 1 died; 7 were continued to the next year. These figures give a daily average number of patients of 15.14. The total loss of service amounted to 5,529, and the average period of treatment was 4.52 days. It will be seen, upon comparison with last year, that the number of admissions, the duration of treatment, and the average number of patients were all increased, the loss of service having been greater by 123 days.

In the zymotic class were noted 75 cases of febricula, 61 of intermittent fever, 12 of measles, and 14 of vaccina, a total of 166, the number of last year being almost exactly doubled. The loss of service was 784 days, the average number sick daily was 2.14, and the average period of treatment was 4.72 days.

The constitutional class contributed 33 cases, as against 35 last year. These included 6 of debility, 11 of lumbago, 4 of podagra, 8 of rheumatism, 3 of syphilis, and 1 of torticollis. One case of lumbago was invalided from the service, and 1 of syphilis to hospital. The total loss of service was 361 days, an average of 10.93 for each case.

The class of nervous disorders was represented by the large number of 181 cases, a considerable excess over the number of last year, 159. The principal factor of this number was cephalalgia, of which there were 123 cases, as against 120 last year, and there were 45 cases of neuralgia (1 being invalided), and 4 of vertigo. The total loss of time from these cases was 481 days, and the daily average number of sick was 1.31, while the average duration of treatment was 2.65 days.

The diseases of the eye contributed 45 cases, as against 29 last year, comprising 30 cases of conjunctivitis and 4 each of asthenopia, hordeolum, and ophthalmia tarsi. The loss of service was 203 days, and the average duration of treatment 4.51 days.

Under the head of affections of the respiratory system, 242 cases were returned, a decided increase over the number of last year, which was 195 cases. The large majority of these were trivial cases, resulted from catarrhus, of which there were 226, and there were 5 of phthisis, 3 of pleuritis, and 2 of pneumonia. Two cases of phthisis and 1 of pleuritis were invalided to hospital, and there was a death from apnoea. The daily average number of sick was 2.60, the average duration of treatment 4.01 days, and the total number of sick days was 593.

There were 341 cases of diseases of the digestive system, the number differing only by 1 from that of last year. The diseases chiefly contributing were diarrhoea acuta, of which there were 104, of pharyngitis 54, dyspepsia 48, constipatio 47, and tonsillitis 32. The total loss of service was 901 days, the daily average number of sick 2.46, and the average duration of treatment 2.64 days.

The genito-urinary cases numbered 35, an increase from 23 last year. Twenty-one were of gonorrhoea, 5 of orchitis, and 4 of chancroides, the latter being invalided to hospital. The time lost was 504 days, the daily average number of patients 1.38, and the average duration of treatment 14.4 days.

Forty cases fell within the class of integumentary affections, which is 3 less than the number of last year. The average duration of treatment was 6.67 days, and the total loss of service was 267 days.

The cases resulting from violence were 97 in number, a small increase over the preceding year. There were no deaths or invalidings, and the loss of service amounted to 798 days, or 8.22 days for each case.

SPECIAL DUTY, WASHINGTON, D. C.

The surgeon in attendance upon officers in Washington not otherwise provided with medical assistance, reported 147 cases of sickness, all of which recovered with the following exceptions: One invalided to hospital, 5 dead, 3 continued. The daily average number of sick was 8.20, and the average number of days under treatment was 20.37, giving an aggregate loss of service of 2,995 days. As compared with last year these figures show a reduction in the number of admissions of 254, and in the loss of service of 386 days. The average duration of treatment was increased from 11.23 days.

The zymotic class was represented by only 8 cases, which were of malarious origin, viz: 5 of intermittent, and 3 of intermittent fever, a very remarkable reduction from last year, when there were 85 cases. The average duration of treatment of these cases was 18.87 days, and the total loss of service was 151 days.

There were 23 cases of constitutional affections returned, as against 36 last year, of which 3 were adynamia, 6 podagra, 12 rheumatism, and single cases of scrofula and syphilis. The average daily number of sick was 1.12, and the duration of treatment 17.86; the total loss of service was 411 days.

The class of nervous affections included reports of 8 cases, a reduction from 15 last year. They included 1 of aphasia, 2 of apoplexia, 4 of neuralgia, and 1 of melancholia. The loss of service was 235 days, or 29.37 days for each case.

The class of diseases of the respiratory system included 36 cases, very nearly the number of last year. Fifteen were of acute bronchitis, 16 of catarrhus, and 3 of pleuritis. The daily average number of sick was 1.62, the average duration of treatment was 16.47 days, and the total loss of service amounted to 593 days.

Thirty-four cases of diseases of the digestive system were returned, as against 88 last year. The loss of service amounted to 578 days, and there was no invaliding. The average duration of treatment was 17 days.

Eleven cases fell under diseases of the genito-urinary system, 2 less than occurred last year. They comprised 2 cases of albuminuria, of which 1 died; 2 of balanitis, 4 of chancroides, 1 of nephritis, and 2 of urethræ strictura. The average period of treatment was 37.09 days, and the total loss of service was 408 days.

The integumentary cases were 9 in number, of which 5 were eczema and 2 furunculus. The loss of time was 88 days, and the average duration of treatment 9.77 days.

The injuries consisted of 2 cases of stremma and 1 of luxatio, giving a loss of time of 43 days.

SPECIAL DUTY, PORTSMOUTH, N. H.

The service at this station was conducted during only about one-half the year. Thirteen cases were recorded during this time, all of which were restored after an average period of treatment of 19.23 days, making a total loss of service of 250 days. Of these cases 5 were included in the constitutional class, 3 of rheumatism. The respiratory class in-

cluded 3 cases, which gave an average loss of service of 11 days; and 3 cases also fell within the digestive group.

TORPEDO STATION, NEWPORT, R. I.

The number of cases returned from this station during the year was 50, a diminution of 8 as compared with last year. One of these was invalided to hospital, the remainder recovering after an average period of 7.32 days. The number of sick days was 366, corresponding with that of last year.

The zymotic cases of this station were 2 of vaccina, no malarious or epidemic influences prevailing.

In the constitutional class were included 4 cases of adynamia and 2 of rheumatism, 1 of which was invalided.

Seven cases of nervous diseases were recorded, 2 of cephalalgia 3 of neuralgia, and single cases of pleurodynia and paralysis. The loss of service was 140 days, the average duration of treatment 11.71 days.

The respiratory class included 1 case of bronchitis, 6 of catarrhus, and 1 of pleuritis, and the resulting loss of service was 52 days, the average period of treatment being 6.5 days.

Eighteen cases were returned under the head of diseases of the digestive system, as against 19 last year. The chief contributors in this class were dysenteria acuta 7, tonsillitis 4, diarrhœa acuta 3, and colica 2 cases. The average length of treatment was 4.05 days, and the total number of sick days was 73.

Two cases of chancroides were all that were comprised in the genito-urinary class, while of integumentary diseases there were noted 2 cases of abscessus, and 2 of furunculus.

The injuries were composed of single cases of abrasio, vulnus contusum, and vulnus punctum.

SPECIAL DUTY, NEW YORK, N. Y.

There were 16 cases reported by the medical officer of this station, of which 1 was transferred to hospital, and 1 died. The average duration of treatment was 19.19 days, and the total number of sick days amounted to 307. Of the cases noted, 2 were of adynamia, 3 of neuralgia, 1 of hordeolum, 2 of catarrhus, and 1 of albuminuria, the latter ending fatally after 60 days of treatment. Four cases of integumentary diseases were treated, the average duration being 33 days. There were no injuries.

SPECIAL DUTY, SAN FRANCISCO, CAL.

Seven cases were returned from this station, giving a total number of sick days of 60. Six cases recovered, and 1 died. The class of constitutional diseases contained 2 cases, 1 of gangrena senilis, which was fatal, and 1 of acute rheumatism. Of the digestive diseases there were single cases of acute diarrhœa and pharyngitis which were briefly under treatment, and there was 1 case of poisoned wound.

TABLE I.—Showing the number admitted and discharged, number of sick days, average num-

Naval stations.	Remaining from last year.	Admitted.				
		First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Total treated.
Navy-yard, Portsmouth, N. H.	4	9	17	21	18	69
Navy-yard, Boston, Mass.	5	65	45	58	19	192
Navy-yard, Brooklyn, N. Y. ....	.....	3	2	7	8	20
Navy-yard, League Island, Pa.	5	34	42	48	37	166
Navy-yard, Washington, D. C.	1	23	29	33	24	110
Navy-yard, Norfolk, Va. ....	.....	27	39	51	36	153
Navy-yard, Pensacola, Fla. ....	.....	16	12	11	5	44
Navy-yard, Mare Island, Cal.	1	36	23	24	22	106
Marine Barracks, Brooklyn, N. Y.	6	94	92	126	122	440
Marine Barracks, Washington, D. C.	3	31	37	23	18	112
Naval Academy, Annapolis, Md.	7	456	264	51	444	1,222
Naval Dispensary, Washington, D. C.	11	34	37	23	42	147
Special duty, Portsmouth, N. H. ....	.....	.....	12	1	.....	13
Torpedo station, Newport, R. I. ....	.....	13	14	20	3	50
Naval station, New London, Conn. ....	.....	3	.....	1	.....	4
Special duty, New York.	2	11	1	2	.....	16
Special duty, San Francisco, Cal.	1	3	.....	3	.....	7
Total	46	858	666	503	798	2,871

ber of days under treatment, and the daily average number of sick at the naval stations.

Discharged.					Continued.	Total number of sick days.	Average number of days under treatment.	Daily average number of sick.
Cured.	Invalided.		Died.	Total.				
	To hospital.	From service.						
41	7	11	.....	59	10	2,555	37.02	7
146	42	2	.....	190	2	806	4.19	2.20
16	3	.....	.....	19	1	146	7.3	.40
140	25	1	.....	166	.....	791	4.76	2.16
95	13	.....	1	109	1	617	5.60	1.69
114	38	.....	.....	152	1	595	3.88	1.63
36	6	.....	.....	42	2	238	5.40	.65
89	12	3	.....	104	2	1,427	13.46	3.90
370	60	.....	.....	430	10	2,850	6.47	7.80
96	15	.....	.....	111	1	881	7.86	2.41
1,204	7	3	1	1,215	7	5,529	4.52	15.14
138	1	.....	5	144	3	2,995	20.37	8.20
13	.....	.....	.....	13	.....	250	19.23	.68
49	1	.....	.....	50	.....	366	7.32	1.00
3	.....	.....	1	4	.....	70	17.5	.19
14	1	.....	1	16	.....	307	19.19	.84
6	.....	.....	1	7	.....	60	8.57	.16
2,750	231	20	10	2,831	40	20,483	7.13	56.11

TABLE II.—Showing the aggregate number of admissions, discharges, and deaths, number of sick days, duration of treatment, and daily average number of sick at the naval stations.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						To hospital.	From service.		
A.—GENERAL DISEASES.									
I.—ZYMOTIC DISEASES.									
Erysipelas	6	32	.08	5.33	2	3			1
Febricula	77	175	.47	2.27	76	1			
Febris continua simplex	9	47	.12	5.22	4	5			
Febris intermittens	251	1,275	3.49	5.07	232	18			1
Febris remittens	13	187	.51	14.38	9	4			
Morbilli	13	67	.18	5.15	12	1			
Parotitis	3	24	.06	8	3				
Pertussis	1	5	.01	5	1				
Vaccina	32	227	.62	7.09	32				
Total	405	2,039	5.58	5.03	371	32			2
II.—CONSTITUTIONAL DISEASES.									
Adynamia	30	383	1.04	12.76	25	3			2
Anæmia	5	26	.07	5.2	3	1	1		
Diabetes	2	66	.18	33	1	1			
Gangæna senilis	1	37	.10	37				1	
Lumbago	21	421	1.15	20.04	18	1	1		1
Podagra	12	96	.26	8	12				
Rheumatismus acutus	60	654	1.79	10.9	51	8			1
Rheumatismus chronicus	61	699	1.91	11.45	51	5	2		3
Scrofula	1	34	.09	34	1				
Syphilis primitiva	37	427	1.16	11.54	23	12			2
Syphilis consecutiva	30	176	.48	5.86	15	14			1
Torticollis	1	5	.01	5	1				
Total	261	3,024	8.28	11.58	201	45	4	1	10
B.—LOCAL DISEASES.									
I.—DISEASES OF THE NERVOUS SYSTEM.									
Aphasia	1	25	.06	25	1				
Apoplexia	3	3		1		1		2	
Cephalalgia	139	248	.67	1.78	138	1			
Convulsio	3	9	.02	3	3				
Dementia	5	34	.09	6.8		3	1		1
Epilepsia	7	45	.12	6.42	2	5			
Hysteria	1	65	.17	65			1		
Insolatio	2	17	.04	8.5	1	1			
Irritatio spinalis	1	43	.11	43	1				
Mania	1	2		2		1			
Melancholia	4	98	.26	24.5	1	1	1		1
Meningitis	2	22	.06	11	1	1			
Neuralgia	89	686	1.87	7.70	85	3			1
Nostalgia	2	8	.02	4	2				
Paralysis	5	201	.55	40.2	4		1		
Pleurodynia	13	39	.10	3	13				
Sciatica	1	14	.03	14	1				
Vertigo	5	24	.06	4.8	5				
Total	284	1,583	4.33	5.57	258	17	4	2	3
II.—DISEASES OF THE EYE.									
Amaurosis	1	19	.05	19					1
Asthenopia	5	25	.06	5	5				
Cataracta	1	143	.39	143	1				
Conjunctivitis	43	178	.48	4.13	41	2			
Choroiditis	1	131	.35	131		1			
Hemeralopia	2	62	.16	31	2				
Hordeolum	5	19	.05	3.8	5				
Iritis	3	32	.08	10.66	2	1			
Keratitis	1	86	.23	86			1		
Ophthalmia	4	20	.05	5	4				
Ophthalmia tarsi	4	10	.02	2.5	4				
Retinitis	2	41	.11	20.5		1	1		
Total	72	766	2.10	10.63	64	5	2		1

TABLE II.—Showing the aggregate number of admissions, discharges, &c.—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						To hospital.	From service.		
B.—LOCAL DISEASES—Continued.									
III.—DISEASES OF THE EAR.									
Otalgia.....	6	14	.03	2.33	6	.....	.....	.....	.....
Otitis.....	4	62	.16	13	3	1	.....	.....	.....
Otorrhœa.....	1	5	.01	5	1	.....	.....	.....	.....
Surditas.....	5	201	.55	40.2	5	.....	.....	.....	.....
Total.....	16	282	.77	17.62	15	1	.....	.....	.....
IV.—DISEASES OF THE TEETH.									
Odontalgia.....	21	51	.13	2.42	21	.....	.....	.....	.....
V.—DISEASES OF THE CIRCULATORY SYSTEM.									
Aneurysma.....	1	1	.....	1	.....	.....	.....	1	.....
Angina pectoris.....	1	1	.....	1	.....	.....	.....	1	.....
Dilatatio cordis.....	2	24	.06	12	2	.....	.....	.....	.....
Hypertrophica cordis.....	4	99	.27	24.75	3	.....	1	.....	.....
Morbi valvularum cordis.....	7	375	1.02	53.57	4	1	1	1	.....
Palpitatio.....	5	166	.42	32.2	5	.....	.....	.....	.....
Syncope.....	2	3	.....	1.5	2	.....	.....	.....	.....
Varix.....	6	75	.20	12.5	4	2	.....	.....	.....
Total.....	28	744	2.03	26.57	20	3	2	3	.....
VI.—DISEASES OF THE RESPIRATORY SYSTEM.									
Apnœa.....	1	1	.....	1	.....	.....	.....	1	.....
Asthma.....	4	66	.18	16.5	3	.....	1	.....	.....
Bronchitis acuta.....	55	432	1.18	7.85	49	3	.....	.....	3
Bronchitis chronica.....	8	329	.90	41.25	2	3	2	.....	1
Catarrhus.....	343	1,545	4.23	4.50	340	3	.....	.....	.....
Emphysema.....	2	20	.05	10	2	.....	.....	.....	.....
Hæmoptysis.....	3	23	.06	7.66	2	1	.....	.....	.....
Laryngitis.....	10	53	.14	5.30	9	1	.....	.....	.....
Phthisis pneumonica acuta.....	2	23	.06	11.5	1	1	.....	.....	.....
Phthisis pneumonica chronica.....	16	339	.92	5.75	8	6	.....	.....	2
Pleuritis.....	8	133	.36	16.62	5	3	.....	.....	.....
Pneumonia.....	8	87	.20	10.87	2	5	.....	1	.....
Total.....	460	3,051	8.08	.....	423	26	3	2	6
VII.—DISEASES OF THE DIGESTIVE SYSTEM.									
Cholera morbus.....	33	107	.29	3.24	32	1	.....	.....	.....
Colica.....	45	131	.35	2.91	44	1	.....	.....	.....
Congestio hepatis.....	8	71	.19	8.87	6	2	.....	.....	.....
Constipatio.....	56	118	.32	2.10	56	.....	.....	.....	.....
Diarrhœa acuta.....	240	705	1.93	2.93	236	4	.....	.....	.....
Diarrhœa chronica.....	13	112	.30	8.61	12	1	.....	.....	.....
Dysenteria acuta.....	13	67	.18	5.15	12	1	.....	.....	.....
Dysenteria chronica.....	2	6	.01	3	2	.....	.....	.....	.....
Dyspepsia.....	79	458	1.25	5.79	73	4	1	.....	1
Fistula in ano.....	2	41	.11	20.5	2	.....	.....	.....	.....
Gastritis.....	4	17	.04	4.25	4	.....	.....	.....	.....
Hæmorrhoids.....	17	114	.31	6.70	12	5	.....	.....	.....
Hepatitis acuta.....	1	25	.06	25	.....	1	.....	.....	.....
Hepatitis chronica.....	1	1	.....	1	1	.....	.....	.....	.....
Hernia.....	8	138	.37	17.25	4	4	.....	.....	.....
Icterus.....	9	93	.25	10.33	7	2	.....	.....	.....
Pharyngitis.....	79	413	1.13	5.22	76	1	.....	.....	2
Prolapsus ani.....	1	9	.02	9	1	.....	.....	.....	.....
Rhagades ani.....	1	31	.08	31	1	.....	.....	.....	.....
Tonsillitis.....	67	304	.83	4.53	65	.....	.....	.....	2
Vermes.....	1	5	.01	5	1	.....	.....	.....	.....
Total.....	680	2,966	8.12	4.36	647	27	1	.....	5

TABLE II.—Showing the aggregate number of admissions, discharges, &c.—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.		Number died.	Number continued.
						To hospital.	From service.		
B.—LOCAL DISEASES—Continued.									
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.									
Albuminuria.....	5	113	.30	22.6	1	2		2	
Balanitis.....	8	54	.14	6.75	8				
Colica nephritica.....	1	2		2	1				
Chancroides.....	9	115	.31	12.77	5	4			
Cystitis.....	11	301	.82	27.36	8	3			
Dysuria.....	1	1		1	1				
Enuresis.....	3	20	.05	6.66	2	1			
Epididymitis.....	2	20	.05	10	2				
Gonorrhœa.....	95	1,069	2.93	11.25	72	20	2		1
Ischuria.....	1	1		1	1				
Nephritis.....	3	34	.09	11.33	2	1			
Orchitis.....	27	323	.88	11.96	22	4			1
Phymosis.....	1	1		1		1			
Spermatorrhœa.....	1	33	.09	33	1				
Urethræ strictura.....	9	123	.33	13.66	3	6			
Total.....	177	2,210	6.05	12.48	129	42	2	2	2
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.									
Arthritis.....	4	48	.13	12	3	1			
Ankylosis.....	1	3		3		1			
Periostitis.....	3	25	.06	8.33	2	1			
Synovitis.....	5	37	.10	7.4	4	1			
Total.....	13	113	.30	8.69	9	4			
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.									
Abscessus.....	20	186	.50	9.3	17	3			
Acne.....	1	3		3					1
Anthrax.....	3	50	.13	16.66	3				
Clavus.....	1	3		3	1				
Ecthyma.....	1	2		2	1				
Eczema.....	12	227	.62	18.91	9	2			1
Erythema.....	2	10	.02	5	2				
Furunculus.....	50	247	.67	4.94	49	1			
Herpes.....	2	44	.12	22	2				
Paronychia.....	9	99	.27	11	8				1
Pediculi pubis.....	2	7	.01	3.5	2				
Pediculi corporis.....	1	4	.01	4	1				
Porrigio.....	1	8	.02	8	1				
Prurigo.....	1	1		1		1			
Psoriasis.....	1	27	.07	27	1				
Tinea.....	1	1		1		1			
Unguis involutis.....	1	5	.01	5	1				
Ulcus.....	16	211	.57	13.18	14				2
Urticaria.....	1	6	.01	6	1				
Verruca.....	1	1		1		1			
Total.....	127	1,142	3.12	8.99	113	9			5
XI.—DISEASES OF THE ABSORBENT SYSTEM.									
Adenitis.....	11	137	.37	12.45	9	1			1
XII.—NON-MALIGNANT TUMORS AND CYSTS.									
Lipoma.....	1	5	.01	5	1				
Polypus.....	1	19	.05	19	1				
Total.....	2	24	.06	12	2				

TABLE II.—Showing the aggregate number of admissions, discharges, &c.—Continued.

Diseases and injuries.	Number of cases.	Number of sick days.	Average number of men sick daily.	Average number of days under treatment.	Number discharged to duty.	Invalided.			
						To hospital.	From service.	Number died.	Number continued.
C.—POISONS.									
Alcoholismus	45	135	.36	3	43	2	.....	.....	.....
Colica pictonum.....	1	1	.....	1	.....	1	.....	.....	.....
Ebriositas.....	3	5	.01	1.66	3	.....	.....	.....	.....
Vulnus venenatum.....	1	1	.....	1	1	.....	.....	.....	.....
Total.....	50	142	.38	2.84	47	3	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.									
Abrasio.....	22	107	.26	4.86	22	.....	.....	.....	.....
Ambustio.....	8	105	.26	13.12	8	.....	.....	.....	.....
Concussio cerebri.....	1	4	.01	4	1	.....	.....	.....	.....
Congelatio.....	1	1	.....	1	.....	1	.....	.....	.....
Contusio.....	68	304	.83	4.47	63	4	.....	.....	1
Fractura.....	15	468	1.28	31.2	9	4	.....	.....	2
Luxatio.....	3	38	.10	12.66	3	.....	.....	.....	.....
Stremma.....	81	624	1.70	7.70	74	4	1	.....	2
Vulnus contusum.....	33	199	.54	6.03	32	1	.....	.....	.....
Vulnus incisum.....	15	140	.38	9.33	15	.....	.....	.....	.....
Vulnus laceratum.....	11	85	.23	7.72	10	1	.....	.....	.....
Vulnus punctum.....	4	32	.08	8	4	.....	.....	.....	.....
Vulnus sclopetarium.....	2	102	.27	51	.....	1	1	.....	.....
Total.....	264	2,209	6.05	8.36	241	16	2	.....	...
Grand total.....	2,871	20,483	56.11	7.13	2,570	231	20	10	40

TABLE III.—Showing the number of admissions, invalided, and

Vessels or stations.....	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas	1				2	2		
Febricula					1	1		
Febris continua simplex.....					7			
Febris intermittens	3							
Febris remittens					1			
Pertussis.....					5			
Vaccina.....								
Total.....	4				16	3		
Ratio per thousand.....	57.97				83.33	15.62		
Number of sick days	107				79			
Average number sick daily	.29				.21			
Average number sick daily per thousand.....	4.20				1.09			
Average duration of treatment.....	26.75				4.93			
II.—CONSTITUTIONAL DISEASES.								
Adynamia	2				5	2		
Anæmia.....								
Diabetes					1	1		
Lumbago	1				3			
Rheumatismus acutus	3				9	2		
Rheumatismus chronicus	5		2		4			
Syphilis primitiva					5	5		
Syphilis consecutiva					4	4		
Total	11		2		31	14		
Ratio per thousand.....	159.41		28.99		161.44	72.91		
Number of sick days.....	650				131			
Average number sick daily	1.78				.35			
Average number sick daily per thousand.....	25.79				1.82			
Average duration of treatment.....	59.09				4.2			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia								
Dementia	2		1		1	1		
Epilepsia					1	1		
Hysteria	1		1					
Insolatio								
Mania								
Melancholia.....	1		1					
Neuralgia					2	1		
Nostalgia								
Paralysis.....	1		1		1			
Pleurodynia.....								
Total.....	5		4		5	3		
Ratio per thousand.....	72.46		57.97		26.04	15.62		
Number of sick days.....	191				63			

dead, for each disease and injury, at the several naval stations.

Navy-yard, Brooklyn, N. Y.				Navy-yard, League Isl. and Pa.				Navy-yard, Washington, D. C.				Navy-yard, Norfolk, Va.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
1	1											1	1		
3				1	1			5	3			32	6		
				38	7			30	2			4	4		
				2				2				6			
4	1			41	8			37	5			43	11		
200	50			246.98	48.19			336.36	45.45			281.04	71.89		
10				147				188				124			
.02				.40				.51				.33			
1				2.40				4.63				2.15			
2.5				3.58				5.08				2.88			
1				2	1			2							
				4	1	1									
2				4				4				10	1		
				7	1			1				4	1		
				1				1				3	2		
3				18	3	1		8				18	4		
150				108.43	18.07	6.02		7.272				117.64	26.14		
62				117				40				77			
.16				.32				.10				.21			
8				1.92				.90				1.37			
20.66				6.05				5				4.27			
1				1				4				3	1		
1	1							1	1			1			
				7				1				1			
								2							
				2				1				3			
2	1			10				9	1			8	1		
100	50			80.24				81.81	9.09			52.28	6.53		
2				17				89				45			

TABLE III.—Showing the number of admissions, invalided, and dead

Vessels or stations	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
.—DISEASES OF THE NERVOUS SYSTEM—Cont'd.								
Average number sick daily	.52				.17			
Average number sick daily per thousand.....	7.53				.88			
Average duration of treatment.....	38.2				12.6			
II.—DISEASES OF THE EYE.								
Conjunctivitis					1			
Hemeralopia	2							
Total.....	2				1			
Ratio per thousand.....	28.99				5.20			
Number of sick days.....	62				2			
Average number sick daily.....	.16							
Average number sick daily per thousand.....	2.31							
Average duration of treatment.....	31				1			
III.—DISEASES OF THE EAR.								
Otalgia					1			
Otitis.....					1			
Total.....					2			
Ratio per thousand					10.40			
Number of sick days.....					13			
Average number sick daily.....					.03			
Average number sick daily per thousand.....					.15			
Average duration of treatment.....					6.5			
IV.—DISEASES OF THE TEETH.								
Odontalgia								
Ratio per thousand.....								
Number of sick days.....								
Average number sick daily.....								
Average number sick daily per thousand								
Average duration of treatment.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Aneurysma								
Dilatatio cordis								
Hypertrophica cordis								
Morbi valvularum cordis.....	1			1				
Palpitatio	1							
Varix								
Total.....	2		1					

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations.....	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
Diseases and injuries.								
B.—LOCAL DISEASES—Continued.								
V.—DISEASES OF THE CIRCULATORY SYSTEM—Continued.								
Ratio per thousand.....	28.99		14.49					
Number of sick days.....	157							
Average number sick daily.....	.43							
Average number sick daily per thousand.....	6.23							
Average duration of treatment.....	78.5							
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Asthma.....					1		1	
Bronchitis acuta.....	3				11			
Bronchitis chronica.....	4	1	2		1	1		
Catarrhus.....	6				16	1		
Emphysema.....	1							
Hæmoptysis.....								
Laryngitis.....					2			
Phthisis pneumonica acuta.....	1							
Phthisis pneumonica chronica.....	2	1			2	1		
Pleuritis.....								
Pneumonia.....								
Total.....	17	2	2		33	3	1	
Ratio per thousand.....	246.37	28.99	28.99		171.85	15.62	5.20	
Number of sick days.....	519				176			
Average number sick daily.....	1.42				48			
Average number sick daily per thousand.....	20.28				2.50			
Average duration of treatment.....	30.52				5.33			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus.....					1			
Colica.....					1			
Congestio hepatis.....								
Constipatio.....					1			
Diarrhœa acuta.....	1				22			
Diarrhœa chronica.....	1	1						
Dyspepsia.....					6	1		
Hæmorrhoids.....	3	1						
Hepatitis chronica.....								
Hernia.....	1							
Icterus.....								
Pharyngitis.....	1				4			
Prolapsus ani.....					1			
Tonsillitis.....					2			
Vermes.....								
Total.....	7	2			38	1		
Ratio per thousand.....	101.45	28.99			197.91	5.20		
Number of sick days.....	226				113			
Average number sick daily.....	.61				.30			
Average number sick daily per thousand.....	8.84				1.56			
Average duration of treatment.....	32.28				2.97			

for each disease and injury, at the several naval stations—Continued.

Navy-yard, Brooklyn, N. Y.				Navy-yard, League Isl- and, Pa.				Navy-yard, Washington, D. C.				Navy-yard, Norfolk, Va.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
				6.02				45.45			9.09	13.07			
				1				73				39			
								.20				.10			
								1.81				.65			
				1				14.6				19.5			
2				4	1			4	1			1			
				7	1			1				1			
								2				6	1		
								1							
				1	1			2							
								1							
				1				1				1	1		
				1	1			1	1						
2				13	4			13	2			9	2		
100				78.31	24.04			118.18	18.18			58.82	13.07		
17				54				61				51			
.04				.14				.16				.13			
2				.84				1.45				.84			
8.5				4.15				4.69				5.66			
				4	1			1				8	1		
				6	2										
2				18				3				27	4		
				2				1				2			
1				2								1	1		
				1	1							1	1		
								1							
1				1				1							
				1				5							
2				3				1				2			
				1											
6				39	4			13				41	7		
300				234.93	24.04			118.18				268	45.75		
37				182				63				136			
.10				.49				.17				.37			
5				2.95				1.54				2.41			
6.16				4.66				4.84				3.31			

TABLE III.—Showing the number of admissions, invalided, and dead.

Vessels or stations.....	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
Diseases and injuries.								
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Balanitis					1			
Chancroides	1							
Cystitis								
Dysuria					1			
Enturesis								
Gonorrhœa	2				17	13	1	
Nephritis	1							
Orchitis	2				2			
Phymosis								
Urethræ strictura	2	2			1	1		
Total	8	2			22	14	1	
Ratio per thousand	115.94	28.90			114.58	72.91	5.20	
Number of sick days	143				63			
Average number of sick daily	.39				.17			
Average number sick daily per thousand	5.65				.88			
Average duration of treatment	17.87				2.86			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Synovitis	1							
Total	1							
Ratio per thousand	14.49							
Number of sick days	18							
Average number of sick daily	.04							
Average number sick daily per thousand	.57							
Average duration of treatment	18							
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus								
Acne								
Anthrax								
Eczema								
Furunculus					7			
Paronychia					1			
Prurigo					1	1		
Psoriasis	1							
Tinea					1	1		
Ulcer	1							
Total	2				10	2		
Ratio per thousand	28.99				52.08	10.40		
Number of sick days	38				40			
Average number sick daily	.10				.10			
Average number sick daily per thousand	1.44				.52			
Average duration of treatment	19				4			

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis	1							
Ratio per thousand	14.49							
Number of sick days	11							
Average number sick daily	.03							
Average number sick daily per thousand	4.3							
Average duration of treatment	11							
XII.—NON MALIGNANT TUMORS AND CYSTS.								
Lipoma								
Total								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Average sick daily per thousand								
Average duration of treatment								
C.—POISONS.								
Alcoholismus					12			
Ebriositas					1			
Total					13			
Ratio per thousand					67.71			
Number of sick days					36			
Average number sick daily					.09			
Average number sick daily per thousand					.46			
Average duration of treatment					2.76			
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio					5			
Ambustio					1			
Concussio cerebri	1							
Congelatio					7			
Contusio	4	1			1	1		
Fractura	1							
Luxatio	2		1		2			
Stemma					2	1		
Vulnus contusum					2			
Vulnus incisum					2			
Vulnus laceratum					1			
Vulnus sclopetarium	1		1					
Total	9	1	2		21	2		

for each disease and injury, at the several naval stations—Continued.

Navy-yard, Brooklyn, N. Y.				Navy-yard, League Isl- and, Pa.				Navy-yard, Washington, D. C.				Navy-yard, Norfolk, Va.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....												1	.....	.....	.....
.....												6.5	.....	.....	.....
.....												5	.....	.....	.....
.....												.01	.....	.....	.....
.....												.06	.....	.....	.....
.....												5	.....	.....	.....
.....															
.....								1	.....	.....	.....	.....	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....								9.09	.....	.....	.....	.....	.....	.....	.....
.....								5	.....	.....	.....	.....	.....	.....	.....
.....								.01	.....	.....	.....	.....	.....	.....	.....
.....								.09	.....	.....	.....	.....	.....	.....	.....
.....								5	.....	.....	.....	.....	.....	.....	.....
.....															
.....				6	.....	.....	.....	4	.....	.....	.....	1	.....	.....	.....
.....				2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				8	.....	.....	.....	4	.....	.....	.....	1	.....	.....	.....
.....				48.19	.....	.....	.....	36.36	.....	.....	.....	.65	.....	.....	.....
.....				15	.....	.....	.....	7	.....	.....	.....	4	.....	.....	.....
.....				.04	.....	.....	.....	.01	.....	.....	.....	.01	.....	.....	.....
.....				.24	.....	.....	.....	.09	.....	.....	.....	.06	.....	.....	.....
.....				1.87	.....	.....	.....	1.75	.....	.....	.....	4	.....	.....	.....
.....															
.....								1	.....	.....	.....	2	.....	.....	.....
.....				1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....				9	1	.....	.....	.....	.....	.....	.....	3	1	.....	.....
.....												6	2	.....	.....
.....				3	.....	.....	.....	6	2	.....	.....	.....	.....	.....	.....
.....								1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
.....				1	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....
.....								1	1	.....	.....	.....	.....	.....	.....
.....				16	2	.....	.....	11	4	.....	.....	11	3	.....	.....

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Navy-yard, Portsmouth, N. H.				Navy-yard, Boston, Mass.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES, &c.—Continued.								
Ratio per thousand	130. 43	14. 49	28. 99	.....	109. 38	10. 40	.....	.....
Number of sick days	433	.....	.....	.....	90	.....	.....	.....
Average number sick daily	1. 18	.....	.....	.....	. 24	.....	.....	.....
Average number sick daily per thousand	17. 10	.....	.....	.....	1. 25	.....	.....	.....
Average duration of treatment.....	48 11	.....	.....	.....	4. 28	.....	.....	.....
Grand total	69	7	11	.....	192	42	2	.....
Ratio per thousand	1, 000	101. 45	159. 42	.....	1, 000	218. 75	10. 40	.....
Number of sick days	2, 555	.....	.....	.....	806	.....	.....	.....
Average number sick daily	7	.....	.....	.....	2. 20	.....	.....	.....
Average number sick daily per thousand	101. 44	.....	.....	.....	11. 45	.....	.....	.....
Average duration of treatment.....	37. 02	.....	.....	.....	4. 19	.....	.....	.....

for each disease and injury, at the several naval stations—Continued.

Navy-yard, Brooklyn, N. Y.				Navy-yard, League Isl. and, Pa.				Navy-yard, Washington, D. C.				Navy-yard, Norfolk, Va.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....				96.39	12.04	.....	.....	100	36.36	.....	.....	71.89	19.61	.....	.....
.....				81	.....	.....	.....	37	.....	.....	.....	52	.....	.....	.....
.....				.22	.....	.....	.....	.10	.....	.....	.....	.14	.....	.....	.....
.....				1.32	.....	.....	.....	.90	.....	.....	.....	.91	.....	.....	.....
.....				5.06	.....	.....	.....	3.36	.....	.....	.....	4.72	.....	.....	.....
20	3	.....	..	166	25	1	.....	110	13	.....	1	163	38	.....	.....
1,000	150	.....	.....	1,000	150.60	6.02	.....	1,000	118.18	.....	9.09	1,000	284.37	.....	.....
146				791	.....	.....	.....	617	.....	.....	.....	595	.....	.....	.....
.40				2.16	.....	.....	.....	1.69	.....	.....	.....	1.63	.....	.....	.....
20				13.01	.....	.....	.....	15.39	.....	.....	.....	10.65	.....	.....	.....
7.3				4.76	.....	.....	.....	5.60	.....	.....	.....	3.88	.....	.....	.....

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations.....	Navy-yard, Pensacola, Fla.				Navy-yard, Mare Island, Cal.			
	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
Diseases and injuries.								
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Erysipelas					1			
Febricula					1			
Febris continua simplex					1			
Febris intermittens	7				2			
Febris remittens	1							
Morbilli								
Parotitis								
Vaccina								
Total	8				5			
Ratio per thousand	181.81				47.18			
Number of sick days	49				25			
Average number sick daily	.13				.09			
Average number sick daily per thousand	2.95				56			
Average duration of treatment	6.12				5			
II.—CONSTITUTIONAL DISEASES.								
Adynamia	2							
Anæmia								
Lumbago	1	1						
Podagra								
Rheumatismus acutus					1			
Rheumatismus chronicus					4			
Scrofula								
Syphilis primitiva					4			
Syphilis consecutiva								
Torticollis								
Total	3	1			9			
Ratio per thousand	68.18	22.72			84.89			
Number of sick days	9				103			
Average number sick daily	.02				.28			
Average number sick daily per thousand	.45				2.64			
Average duration of treatment	3				11.44			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Aphasia								
Apoplexia								
Cephalalgia	2							
Convulsio								
Dementia								
Epilepsia					3	1		
Irritatio spinalis								
Melancholia					1	1		
Meningitis								
Neuralgia					3	1		
Paralysis								
Pleurodynia								
Sciatica								
Vertigo								
Total	2				7	3		

for each disease and injury, at the several naval stations—Continued.

Marine barracks, New York.				Marine barracks, Washington, D. C.				Naval Academy, Annapolis, Md.				Naval dispensary, Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	1	.....	.....	.....	75	.....	.....	.....	.....	.....	.....	.....
51	3	.....	.....	12	.....	.....	.....	61	.....	.....	.....	5	.....	.....	.....
1	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....
3	.....	.....	.....	2	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....
55	4	.....	.....	16	.....	.....	.....	166	.....	.....	.....	8	.....	.....	.....
125	9.99	.....	.....	142.85	.....	.....	.....	135.50	.....	.....	.....	54.42	.....	.....	.....
261	.....	.....	.....	108	.....	.....	.....	784	.....	.....	.....	151	.....	.....	.....
.71	.....	.....	.....	.29	.....	.....	.....	2.14	.....	.....	.....	.41	.....	.....	.....
1.61	.....	.....	.....	2.58	.....	.....	.....	1.75	.....	.....	.....	2.78	.....	.....	.....
4.74	.....	.....	.....	6.75	.....	.....	.....	4.72	.....	.....	.....	18.87	.....	.....	.....
.....															
1	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	3	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	.....	.....
.....	4	.....	.....	3	.....	.....	.....	4	.....	.....	.....	6	.....	.....	.....
14	4	.....	.....	2	.....	.....	.....	1	.....	.....	.....	7	.....	.....	.....
23	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	5	.....	.....	.....
.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
20	6	.....	.....	3	2	.....	.....	2	1	.....	.....	1	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
80	19	.....	.....	8	2	.....	.....	33	1	1	.....	23	.....	.....	.....
181.81	43.18	.....	.....	71.42	17.85	.....	.....	27	.81	.81	.....	156.43	.....	.....	.....
660	.....	.....	.....	107	.....	.....	.....	361	.....	.....	.....	411	.....	.....	.....
1.80	.....	.....	.....	.29	.....	.....	.....	.98	.....	.....	.....	1.12	.....	.....	.....
4.09	.....	.....	.....	2.58	.....	.....	.....	.80	.....	.....	.....	7.61	.....	.....	.....
8.25	.....	.....	.....	13.37	.....	.....	.....	10.93	.....	.....	.....	17.86	.....	.....	.....
.....															
.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
2	.....	.....	.....	1	.....	.....	.....	123	.....	.....	.....	2	.....	.....	2
.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
1	1	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	2	.....	.....	1	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
1	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	7	.....	.....	.....	45	1	.....	.....	4	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....
25	4	.....	.....	12	3	.....	.....	181	1	.....	.....	8	.....	.....	2

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Navy-yard, Pensacola, Fla.				Navy-yard, Mare Island, Cal.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
IV.—DISEASES OF THE TEETH—Continued.								
Average number sick daily per thousand.....								
Average duration of treatment.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Angina pectoris								
Hypertrophica cordis								
Morbi valvularum cordis					1			
Palpitatio					1			
Syncope								
Varix					1			
Total.....					3			
Ratio per thousand.....					28.30			
Number of sick days.....					64			
Average number sick daily.....					17			
Average number sick daily per thousand.....					1.60			
Average duration of treatment.....					21.33			
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Apnœa								
Asthma.....	1				2			
Bronchitis acuta.....	3				4	1		
Bronchitis chronica.....								
Catarrhus	1				8			
Emphysema								
Hæmoptisis.....								
Laryngitis					1	1		
Phthisis pneumonica chronica.....					1			
Pleuritis					1			
Pneumonia								
Total.....	5				17	2		
Ratio per thousand.....	113.64				160.37	18.86		
Number of sick days.....	24				175			
Average number sick daily.....	.06				.47			
Average number sick daily per thousand.....	1.36				4.43			
Average duration of treatment.....	4.8				10.29			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus								
Colica	1							
Congestio hepatis.....								
Constipatio								
Diarrhœa acuta	4				5			
Diarrhœa chronica								
Dysenteria acuta					1			
Dysenteria chronica					1			
Dyspepsia					2		1	
Fistula in ano.....								
Gastritis								
Hæmorrhœis.....	1	1						

for each disease and injury, at the several naval stations—Continued.

Marine barracks, New York.				Marine barracks, Washington, D. C.				Naval Academy, Annapolis, Md.				Naval dispensary, Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
								.09							
								2.3							
												1			1
								1		1		1			1
1				2	1			1				1			1
1								1							
				3	2										
2				5	3			4		1		3			2
4.54				44.64	26.78			3.27		.81		20.40			13.6
9				96				105				99			
.02				.26				.28				.27			
.04				2.32				.22				1.83			
4.5				19.2				26.25				33			
								1			1				
2				2				1				15			
1	1														
36				9				226				16			
												1			
1	1							1							
1								3				1			
1	1			1	1			5	2						
1	1							3	1			3			
				3	3			2							
43	4			15	4			242	3		1	36			
97.74	9.99			133.92	35.71			198.03	2.43		.81	244.89			
210				89				971				593			
.57				.24				2.66				1.62			
1.29				2.14				2.16				11.02			
4.88				5.93				4.01				16.47			
12				3				6							
3				1				31				2			
								2							
5								47				2			
39				9				104				1			
												7			
1	1							3				1			
								1							
6	2			3				48				8			
								1				1			
								1				2			
3	1			1				7							

TABLE III.--Showing the number of admissions, invalided, and dead,

Vessels or stations	Navy-yard, Pensacola, Fla.				Navy-yard, Mare Island, Cal.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VII.—DISEASES OF THE DIGESTIVE SYSTEM—Continued.								
Hepatitis acuta					1	1		
Hernia								
Icterus					1	1		
Pharyngitis					3			
Rhagades ani								
Tonsillitis	1				1			
Total	7	1			15	2	1	
Ratio per thousand	159.10	22.72			114.51	18.86	9.42	
Number of sick days	28				145			
Average number sick daily	.07				.39			
Average number sick daily per thousand	1.59				3.67			
Average duration of treatment	4				9.66			
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria								
Balanitis					1			
Colica nephritica								
Chancroides								
Cystitis								
Enuresis								
Epididymitis								
Gonorrhœa					4		1	
Ischuria								
Nephritis					1	1		
Orchitis					4			
Spermatorrhœa					1			
Urethræ strictura								
Total					11	1	1	
Ratio per thousand					103.77	9.42	9.42	
Number of sick days					224			
Average number of sick daily					.61			
Average number sick daily per thousand					5.75			
Average duration of treatment					20.36			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Arthritis					4	1		
Periostitis					1			
Synovitis					1	1		
Total					6	2		
Ratio per thousand					56.60	18.86		
Number of sick days					62			
Average number of sick daily					.16			
Average number sick daily per thousand					1.50			
Average duration of treatment					10.33			

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations	Navy-yard, Pensacola, Fla.				Navy-yard, Mare Island, Cal.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus	2	1			1			
Anthrax					1			
Clavus								
Ecthyma								
Eczema					1			
Erythema								
Furunculus								
Herpes								
Paronychia								
Pediculi pubis								
Pediculi corporis								
Unguis involutis					1			
Ulcus								
Urticaria								
Verruca	1	1						
Total	3	2			4			
Ratio per thousand	68.18	45.45			37.73			
Number of sick days	9				147			
Average number sick daily	.02				.40			
Average number sick daily per thousand	.45				3.77			
Average duration of treatment	3				36.75			
XI.—DISEASES OF THE ABSORBENT SYSTEM.								
Adenitis								
Ratio per thousand								
Number of sick days								
Average number sick daily								
Average number sick daily per thousand								
Average duration of treatment								
XII.—NON-MALIGNANT TUMORS AND CYSTS.								
Polypus	1							
Total	1							
Ratio per thousand	22.72							
Number of sick days	19							
Average number sick daily	.05							
Average number sick daily per thousand	1.13							
Average duration of treatment	19							
C.—POISONS.								
Alcoholismus	3				3			
Colica pictonum	1	1						
Total	4	1			3			

TABLE III.—*Showing the number of admissions, the invalided, and dead,*

Vessels or stations	Navy-yard, Pensacola, Fla.				Navy-yard, Mare Island, Cal.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
C.—POISONS—Continued.								
Ratio per thousand.....	90.90	22.72	.....	.....	28.30	.....	.....	.....
Number of sick days	12	.....	.....	.....	14	.....	.....	.....
Average number sick daily	.03	.....	.....	.....	.01	.....	.....	.....
Average number sick daily per thousand	.68	.....	.....	.....	.28	.....	.....	.....
Average duration of treatment.....	3	.....	.....	.....	4.66	.....	.....	.....
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio	4	.....	.....	.....	1	.....	.....	.....
Ambustio .....	.....	.....	.....	.....	.....	.....	.....	.....
Concussio cerebri.....	.....	.....	.....	.....	.....	.....	.....	.....
Contusio	2	1	.....	.....	3	.....	.....	.....
Fractura	1	.....	.....	.....	.....	.....	.....	.....
Luxatio .....	.....	.....	.....	.....	.....	.....	.....	.....
Stemma	2	.....	.....	.....	7	.....	.....	.....
Vulnus contusum .....	.....	.....	.....	.....	6	.....	.....	.....
Vulnus incisum .....	.....	.....	.....	.....	.....	.....	.....	.....
Vulnus laceratum.....	1	.....	.....	.....	1	.....	.....	.....
Vulnus punctum	1	.....	.....	.....	1	.....	.....	.....
Total.....	11	1	.....	.....	19	.....	.....	.....
Ratio per thousand.....	250	22.72	.....	.....	179.23	.....	.....	.....
Number of sick days	82	.....	.....	.....	167	.....	.....	.....
Average number sick daily.....	.22	.....	.....	.....	.45	.....	.....	.....
Average number sick daily per thousand.....	5	.....	.....	.....	4.24	.....	.....	.....
Average duration of treatment.....	7.45	.....	.....	.....	8.78	.....	.....	.....
Grand total	44	6	.....	.....	106	12	3	.....
Ratio per thousand.....	1,000	136.36	.....	.....	1,000	113.20	28.30	.....
Number of sick days.....	238	.....	.....	.....	1,427	.....	.....	.....
Average number sick daily	.65	.....	.....	.....	3.90	.....	.....	.....
Average number sick daily per thousand	14.77	.....	.....	.....	36.78	.....	.....	.....
Average duration of treatment.....	5.40	.....	.....	.....	13.46	.....	.....	.....

for each disease and injury, at the several naval stations—Continued.

Marine barracks, New York.				Marine barracks, Washington, D. C.				Naval Academy Annapolis, Md.				Naval dispensary, Washington, D. C.			
Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
	To hospital.	From service.			To hospital.	From service.			To hospital.	From service.			To hospital.	From service.	
20.45	4.54	.....	.....	8.93	.....	.....	.....	4.09	.....	.....	.....	6.80	.....	.....	.....
21	.....	.....	.....	2	.....	.....	.....	25	.....	.....	.....	5	.....	.....	.....
.05	.....	.....	.....	.....	.....	.....	.....	.06	.....	.....	.....	.01	.....	.....	.....
.11	.....	.....	.....	.....	.....	.....	.....	.04	.....	.....	.....	.06	.....	.....	.....
2.33	.....	.....	.....	2	.....	.....	.....	5	.....	.....	.....	5	.....	.....	.....
5	.....	.....	.....	3	.....	.....	.....	4	.....	.....	.....	1	.....	.....	.....
1	.....	.....	.....	.....	.....	.....	.....	32	.....	.....	.....	7	.....	.....	.....
7	.....	.....	.....	4	1	.....	.....	7	.....	.....	.....	1	.....	.....	.....
2	2	.....	.....	.....	.....	.....	.....	31	.....	.....	.....	2	.....	.....	.....
1	.....	.....	.....	5	.....	.....	.....	12	.....	.....	.....	.....	.....	.....	.....
14	.....	.....	.....	1	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....
11	.....	.....	.....	3	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
46	2	.....	.....	16	1	.....	.....	97	.....	.....	.....	3	.....	.....	.....
104.54	4.54	.....	.....	142.85	8.93	.....	.....	79.37	.....	.....	.....	20.40	.....	.....	.....
335	.....	.....	.....	70	.....	.....	.....	798	.....	.....	.....	43	.....	.....	.....
.91	.....	.....	.....	.19	.....	.....	.....	2.18	.....	.....	.....	.11	.....	.....	.....
2.06	.....	.....	.....	1.69	.....	.....	.....	1.78	.....	.....	.....	.74	.....	.....	.....
7.28	.....	.....	.....	4.37	.....	.....	.....	8.22	.....	.....	.....	14.33	.....	.....	.....
440	60	.....	.....	112	15	.....	.....	1,222	7	3	1	147	1	5	.....
1,000	136.66	.....	.....	1,000	133.92	.....	.....	1,000	5.72	2.43	.81	1,000	6.80	34.01	.....
28.50	.....	.....	.....	881	.....	.....	.....	5,529	.....	.....	.....	2,995	.....	.....	.....
7.80	.....	.....	.....	2.41	.....	.....	.....	15.14	.....	.....	.....	8.20	.....	.....	.....
17.72	.....	.....	.....	21.51	.....	.....	.....	12.38	.....	.....	.....	55.78	.....	.....	.....
6.47	.....	.....	.....	7.86	.....	.....	.....	4.52	.....	.....	.....	20.37	.....	.....	.....

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations.....	Special duty, Portsmouth, N. H.				Torpedo station, Newport, R. I.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
A.—GENERAL DISEASES.								
I.—ZYMOTIC DISEASES.								
Vaccina.....					2			
Total.....					2			
Ratio per thousand.....					40			
Number of sick days.....					6			
Average number sick daily.....					.01			
Average number sick daily per thousand.....					.20			
Average duration of treatment.....					3			
II.—CONSTITUTIONAL DISEASES.								
Adynamia.....	1				4			
Diabetes.....								
Gangræna senilis.....								
Podagra.....	1							
Rheumatismus acutus.....	1				1	1		
Rheumatismus chronicus.....	2				1			
Total.....	5				6	1		
Ratio per thousand.....	384.61				120	20		
Number of sick days.....	104				69			
Average number sick daily.....	.28				.18			
Average number sick daily per thousand.....	21.53				3.60			
Average duration of treatment.....	20.8				11.5			
B.—LOCAL DISEASES.								
I.—DISEASES OF THE NERVOUS SYSTEM.								
Cephalalgia.....					2			
Neuralgia.....					3			
Paralysis.....					1			
Pleurodynia.....					1			
Total.....					7			
Ratio per thousand.....					140			
Number of sick days.....					82			
Average number sick daily.....					.22			
Average number sick daily per thousand.....					5.50			
Average duration of treatment.....					11.71			
II.—DISEASES OF THE EYE.								
Hordeolum.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations.....	Special duty, Portsmouth, N. H.				Torpedo Station, Newport, R. I.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
II.—DISEASES OF THE EYE—Continued.								
Average number sick daily								
Average number sick daily per thousand.....								
Average duration of treatment.....								
V.—DISEASES OF THE CIRCULATORY SYSTEM.								
Morbi valvularum cordis	1							
Total	1							
Number of sick days	101							
Average number sick daily	.28							
Average duration of treatment.....	101							
VI.—DISEASES OF THE RESPIRATORY SYSTEM.								
Bronchitis acuta	2				1			
Catarrhus	1				6			
Pleuritis					1			
Pneumonia								
Total	3				8			
Ratio per thousand	230.76				160			
Number of sick days	33				52			
Average number sick daily	.09				.14			
Average number sick daily per thousand	6.92				2.50			
Average duration of treatment.....	11				6.5			
VII.—DISEASES OF THE DIGESTIVE SYSTEM.								
Cholera morbus.....	1				2			
Colica.....	1							
Constipatio					1			
Diarrhœa acuta.....	1				3			
Dysenteria acuta.....					7			
Dyspepsia								
Gastritis					1			
Hernia								
Pharyngitis								
Tonsillitis					4			
Total	3				18			
Ratio per thousand	230.76				360			
Number of sick days.....	11				73			
Average number sick daily	.03				.20			
Average number sick daily per thousand	2.30				4			
Average duration of treatment.....	3.66				4.05			

TABLE III.—Showing the number of admissions, invalided, and dead,

Vessels or stations.....	Special duty, Portsmouth, N. H.				Torpedo Station, Newport, R. I.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
B.—LOCAL DISEASES—Continued.								
VIII.—DISEASES OF THE GENITO-URINARY SYSTEM.								
Albuminuria.....								
Cystitis.....					2			
Total.....					2			
Ratio per thousand.....					40			
Number of sick days.....					28			
Average number of sick daily.....					. 07			
Average number sick daily per thousand.....					1. 40			
Average duration of treatment.....					14			
IX.—DISEASES OF THE LOCOMOTIVE SYSTEM.								
Ankylosis.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
Average duration of treatment.....								
X.—DISEASES OF THE INTEGUMENTARY SYSTEM.								
Abscessus.....					2			
Anthrax.....								
Furunculus.....					2			
Porrigio.....								
Ulcus.....								
Total.....					4			
Ratio per thousand.....					80			
Number of sick days.....					36			
Average number sick daily.....					. 09			
Average number sick daily per thousand.....					1. 80			
Average duration of treatment.....					9			
C.—POISONS.								
Vulnus venenatum.....								
Total.....								
Ratio per thousand.....								
Number of sick days.....								
D.—VIOLENT DISEASES AND DEATHS.								
Abrasio.....					1			
Contusio.....	1							
Stemma.....					1			
Vulnus punctum.....					1			
Total.....	1				3			

TABLE III.—*Showing the number of admissions, invalided, and dead,*

Vessels or stations	Special duty, Portsmouth, N. H.				Torpedo station, Newport, R. I.			
Diseases and injuries.	Cases.	Invalided.		Dead.	Cases.	Invalided.		Dead.
		To hospital.	From service.			To hospital.	From service.	
D.—VIOLENT DISEASES, &c.—Continued.								
Ratio per thousand.....	76.92	.....	.....	.....	60	.....	.....	.....
Number of sick days.....	1	.....	.....	.....	20	.....	.....	.....
Average number sick daily .....	.....	.....	.....	.....	.05	.....	.....	.....
Average number sick daily per thousand .....	.....	.....	.....	.....	1	.....	.....	.....
Average duration of treatment.....	1	.....	.....	.....	6.66	.....	.....	.....
Grand total	13	.....	.....	.....	50	1	.....	.....
Ratio per thousand.....	1,000	.....	.....	.....	1,000	20	.....	.....
Number of sick days	250	.....	.....	.....	366	.....	.....	.....
Average number sick daily	.68	.....	.....	.....	1	.....	.....	.....
Average number sick daily per thousand	52.30	.....	.....	.....	20	.....	.....	.....
Average duration of treatment.....	19.23	.....	.....	.....	7.32	.....	.....	.....

REPORT ON THE MATERIA MEDICA COLLECTION AT THE UNITED STATES NATIONAL MUSEUM.

BY SURGEON J. M. FLINT, U. S. N.

In the establishment of a museum designed to illustrate man and his environment, it is proper that the materials and methods used for the prevention and cure of disease should have a place. Medicine, like food, clothing, and habitation, has a direct and important relation to the welfare, progress, and longevity of man, and the remedial measures in use by a people may be as indicative of the degree of their intellectual development, as is the nature of their food or the character of their dwellings or their social and religious customs. A collection of medicinal substances, of medical, surgical, and pharmaceutical instruments and appliances, may not only be instructive to the specialist, physician, pharmacist, or anthropologist, but ought also to possess a general interest for the public, since none may escape the occasion for their use, and all men, whatever their theories while in health, are only too willing to make use of these material weapons for defense when approaches gaunt disease or grim death.

So much in brief explanation of the presence of a materia medica exhibit in the United States National Museum.

In the comprehensive scheme of museum classification which has been devised, a place for such a collection has been provided in the division, "ultimate products and their utilization," class "medicine, surgery, pharmacology, hygiene, &c."

For the objects belonging to this class, the general term "materia medica" has been adopted, extending the common definition to include everything, medical or surgical, used in the treatment of disease.

In determining upon a classification for this department of the Museum, it was necessary to consider the subject from various points of view. 1st. The historical, as relating to the origin and progress, the evolution of medical and surgical science and art; 2d. The ethnographical, regarding the medicines and methods peculiar to different races and nations; 3d. The therapeutical, which considers drugs only in relation to their effects on the animal economy; 4th. The physical, having regard to the sources, physical characters, and natural relations to the specimens.

The first method is obviously not adapted for a general classification of a large collection, but should always be kept in view, and may be emphasized, particularly in the development of the section of surgical instruments and appliances. The second may be carried out in part, as in separate exhibits of Chinese and Corean medicines and the medicines of the North American Indians. The third, though perhaps the most instructive method to the student, presents difficulties in the way of accomplishment that are well-nigh insurmountable. The physiological action of a drug may so vary with the dose as to make its assignment to a class purely arbitrary, and the very classification would give a

wrong impression as to its properties. Moreover, the investigation of many drugs has been so limited as to leave their therapeutical qualities in great doubt. So while the medical properties, as far as known, should be briefly stated on the label for each specimen, yet they cannot properly be used as a basis of classification.

There remains then only the physical relations of drugs to be considered, and of these the natural sources from which derived furnish the most readily available and the most comprehensive ground for a classification.

In view of these considerations the following has been adopted:

CLASSIFICATION AND ARRANGEMENT OF THE MATERIA MEDICA COLLECTION.

PRIMARY DIVISIONS.

I.—Organic materia medica:

1. Animal products.
2. Vegetable products.
3. Products of fermentation and distillation.

II.—Inorganic materia medica.

1. The animal products are arranged according to the zoölogical position of the animal from which the drug is derived, following the usual classification, and beginning with the class mammalia, order carnivora.

2. Vegetable products are classified according to the botanical affinities of the plant furnishing the drug, and the authority followed is that of Bentham and Hooker's "*Genera plantarum*," for the phænogamous plants, and Lueresen "*Medicinisch pharmaceutische botanik*" for the cryptogams.

3. Products of fermentation and distillation include the products of the acetous and vinous fermentations, and their derivatives: chloroform, ether, &c., as well as distillates such as carbolic acid, pyroligneous acid, &c. This division is not subdivided.

4. Inorganic products are arranged according to their fundamental elementary constituents, following the classification of the chemical elements given in Roscoe and Schorlemmer's "*Treatise on Chemistry*."

In each of these four divisions, under each natural order or elementary title are brought together the drugs of that order, and each drug is represented in its various natural and commercial varieties and its important preparations.

The collection as actually presented for study begins with a series designed to illustrate the forms in which medicinal substances appear in commerce or are prepared for administration by the pharmacist. In this series the effort has been made to present representative specimens of each class, and what is considered to be of greater importance, to attach thereto labels giving concise and accurate definitions of the classes. I append the classification of medicinal forms which this series is intended to represent with the list of illustrative examples presented.

Following this exhibit of medicinal forms is arranged the general collection according to the classification first given, beginning with animal products in their zoölogical order, succeeded by vegetable products in botanical order, &c. The succession of specimens is from left to right and top to bottom of each section of exhibition case in which the collection is presented. Each order and its limits are indicated by symbol and name on the case.

Succeeding the general collection is an exhibit of some of the most popular mineral waters. Each of these is shown in the quality of 10 liters and with it each of its saline constituents, in the exact weight which analysis has shown to be present in that volume of the water; thus representing to the eye the quantity of each constituent salt ingested with a given quantity of water, and furnishing a quantitative table, without the use of figures, for comparison of the different mineral waters.

Finally is presented as a distinct exhibit a considerable collection of Chinese drugs, which were gathered by the Chinese imperial customs commission for the Centennial Exhibition at Philadelphia, in the year 1876, and subsequently presented to the United States Government.

The whole number of specimens, including the Chinese collection, registered in the books of this department of the Museum, up to October 20, is 4,012. Of these, after rejection of duplicates and unidentified and injured drugs, there have been classified and placed on exhibition 3,240.

The sources from which they have been obtained are: 1st. Contributions from large commercial houses engaged in the wholesale drug trade, notably the firm of W. H. Schiefflin & Co., New York, and, generously but less lavishly, Parke, Davis & Co., of Detroit; and Wallace Brothers, of Statesville, N. C.; 2d. Exchanges with foreign museums, as the Kurrachee Museum, India, the museum of the Pharmaceutical Society, London, and the royal gardens of Kew and Calcutta; 3d. Collections of Cinchona barks, made under direction of the English Government from the plantations in India; 4th. Remains of the drug exhibits of several countries at the Centennial Exhibition at Philadelphia in 1876, which were presented to the United States by the authorities of those countries.

As a whole the collection already represents the principal drugs in most of their commercial varieties in present use among the civilized people of the world, including most of the new remedies that have been lately introduced to the notice of the profession. An alphabetical index to the collection has been prepared and printed giving the details of the classification and the position therein of every specimen on exhibition. A copy of the same is herewith inclosed. The collection of Cinchona barks is especially complete, comprising specimens of nearly all the natural barks of South America, and every variety of the cultivated product from the government plantations of India, with many from Java, Ceylon, Mexico, and Jamaica. The India and Jamaica barks are accompanied by herbarium specimens of the leaf and flower, and in some cases the fruit of each variety of Cinchona tree from which the bark was taken.

For the proper preservation and exhibition of the whole collection great care has been taken. Every specimen is inclosed in a clear glass bottle or jar, furnished with a well-fitted glass stopper. The bottles have been made of uniform shapes and sizes according to the standard established for the Museum. Care has been exercised that every specimen should be thoroughly dry before being inclosed, and if liable to attacks of insects has been enveloped in an atmosphere of chloroform by introducing into the bottle a small slip of blotting-paper wetted with the insecticide. The cases in which the collection is exhibited are of Mexican mahogany, 7 feet high and 8½ feet long, with plate glass doors, the door-frames being rabbeted so as to make the cases practically dust proof. The cases contain each four shelves, the lowest 18 inches and the highest 5 feet from the floor, thus bringing every specimen within

easy range of vision. Each bottle stands upon a wooden pedestal 4 inches square and 1 inch high, and to this pedestal is attached the label.

Without doubt the most important duty connected with the installation of the collection is the preparation of the labels. Monotonous rows of bottles bearing only the name of the drug inclosed would furnish little of interest and less of information to the general visitor. Indeed the exhibition of many articles which present no physical peculiarities discernible by the naked eye is only to be justified by the fact that the specimen calls attention to and gives support for a label which interprets it.

In the preparation of these labels more difficulty has been encountered than was expected, chiefly in making choice from the mass of information at hand of those facts most important to be presented, that could be concentrated into the few lines of type to which the label must be restricted, at the same time keeping in mind the popular as well as scientific use of the collection. Such physical characters as are presented to the eye by the specimen itself have been in all cases omitted, and such facts selected, relating to source, habitat, mode of production, constituents, medical properties, &c., as seemed to the writer to be of greatest public as well as professional interest. Two kinds of labels are used:

1st. Generic labels, applicable to series of specimens comprising natural and commercial varieties and preparations of given drugs. These are not strictly limited as to size; are printed in large type and contain general information relating to the substance in question.

2d. Specific labels. These are attached to every specimen; are limited in size to 4 inches by 1½ inches; are printed in ordinary clear type, and contain the name and synonyms, source, medical properties, dose, and other facts that could be condensed within the given limits.

I append samples of these labels as prepared for the collection of alums.

The number of specimens already furnished with printed labels is 675. Copy for 250 labels is ready for the printer.

Arrangements have been made or are in progress by which the natural sources of the drugs of commerce may be very fully illustrated. Models or stuffed specimens of the animals furnishing substances used in medicine may be found in the different sections of the zoölogical department of the Museum. The chemical elements, ores, &c., in the chemical and mineralogical departments. For the plants furnishing the vegetable medicinal products a large series of colored plates and photographs have been obtained. Upwards of 1,000 medicinal plants can thus be illustrated by colored lithographs taken from works on medical botany and by photographs now in the possession of this section of the Museum. More than half these are already mounted in swinging frames, where they are easily accessible to all visiting the Museum. The nucleus of an herbarium has already been formed and arrangements are complete for its rapid development so soon as the necessary dispositions have been made for its care and exhibition.

Early in the organization of this section of the Museum effort was made to obtain the latest editions of the pharmacopœas of all nations, in order that from them a list might be compiled of the drugs in principal use among the civilized people of the world. Nearly all the latest pharmacopœas have been obtained, and besides furnishing mere lists of medicines they have supplied much interesting material for study and comparison. Some of the results of this comparative study have been

presented in your report for the year 1881.* The work of comparison has been carried much further and the attempt is being made to prepare a compend which shall contain a full official synonymy of each of the drugs mentioned in any of these pharmacopœas and tables giving composition and strength of every preparation. About half this compilation has already been made, but being considered of secondary importance to the work of the collection proper progress upon it has been irregular and slow.

To summarize what has been accomplished, it may be said that the organization of the *materia medica* section of the Museum is complete. The classification has been established in its details; over 4,000 specimens have been received, examined, and registered, and most of them bottled and arranged according to the classification; the whole collection has been provided with temporary labels and 670 specimens with permanent labels, each requiring a study of the specimen and of the literature regarding it. Illustrations of most of the medicinal plants have been obtained and more than 500 of them mounted and on exhibition; a medical herbarium has been commenced and its development assured; a complete catalogue of the collection has been prepared, by means of which any specimen on exhibition may be readily found; a considerable library of references has been formed; the pharmacopœas of nearly all nations have been obtained and received, and half the work of compiling a compend of sixteen of them is done.

In the future development of this section of the Museum, a wide field is clearly open for interesting and valuable work. The collection as it now stands includes samples of the great majority of the drugs found in the commerce of the country, as well as many specimens of rare drugs or varieties known only to foreign medical practice. It remains now to make use of the prestige of the scientific institution with which the Museum is connected, and of the ready means at the disposal of the National Government through its naval and consular services, supplemented by personal correspondence with importers and their agents, and foreign scientists and travelers, to gather materials and information which shall be rare and valuable. There is still much to be learned regarding the source and mode of production of many of our standard drugs, and new remedies of doubtful origin are constantly appearing in the market. For the increase of our knowledge of these substances, for the investigation of these questions of doubt, no more favorable conditions can be conceived than those here existing, namely: A great museum under the patronage of the nation, associated with a scientific institution of world-wide renown, having correspondence with all parts of the world, and friendly relations with scientific establishments in all countries.

It is in the power of the medical officers of the Navy to do much for the collection during their cruises on foreign stations. Let them each collect but a single sample of even a well-known drug, proving its title by a botanical specimen of the plant from which derived, and accompany it by accurate, detailed information regarding the locality in which produced, the mode of cultivation or collection, and method of preparation for the market, and they will have furnished material and knowledge of interest to science and commerce and aided in establishing a collection of standard drugs whose derivation and history shall be beyond doubt.

* Report of the Surgeon-General of the Navy for the year 1881, p. 655. "Report on the pharmacopœas of all nations."

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